ANNOTATED BIBLIOGRAPHY OF METHODOLOGY FOR ASSESSMENT OF UNDISCOVERED OIL AND GAS RESOURCES

By Ronald R. Charpentier[1], Gordon L. Dolton[1], and Gregory F. Ulmishek[1]

PURPOSE

This annotated bibliography was intended to be a useful reference for those engaged in assessing undiscovered oil and gas resources. As such, it is an update of Charpentier and Wesley (1986).

The bibliography includes only papers dealing with resource appraisal methods for undiscovered oil and gas resources. Thus it does not include those that deal with minerals other than oil and gas, nor those that merely present assessments, rather than explain methodology. The papers included deal only with quantitative assessment of undiscovered or inferred resources; therefore papers dealing with non-quantitative methodologies or with quantifying measured or proven reserves are excluded. Papers concerning quantitative measures of drilling favorability, not directly leading to measures of quantity of resources, are also excluded. Inevitably, decisions to include or exclude papers have been somewhat subjective, but we have attempted to be inclusive where there was some question.

The papers have been annotated to show which of the major categories of assessment methods are treated in each. Since many methods combine the use of techniques in multiple categories, the annotation is also subjective in places. In a few cases, relevant papers discussed more general features of resource appraisal rather than specific methods and were therefore labeled "General."

METHOD CATEGORIES

Areal and volumetric yields

Areal and volumetric yield methods calculate resources by multiplying the area or volume of rock to be assessed by a yield factor of hydrocarbons per unit area or volume calculated from analogs. Differences between these methods are due to differences in how the prospective areas and volumes are calculated and also in how a particular factor or range of factors is chosen. In the latter case, the factors may be chosen based on geologic classification of the area, by calculation, or by judgment of geologic similarity. Unit regional values, when calculated specifically for hydrocarbon

resources, fall into this category. The required data include measurements of areas or volumes of rock to be assessed and calculated yield factors for more completely explored analogs.

A major assumption is that geologic or other information can be used to determine a suitable yield factor or range of yield factors. Another assumption is that the analog yield factors used are themselves appropriately calculated. Since any analog area will be incompletely explored, either the analog is assumed to be at a sufficiently mature stage, or the analog yield is calculated from estimates of both discovered and undiscovered resources. This approach could result in circular reasoning in the appraisal process.

The primary advantage of the areal and volumetric yield methods is the ease in assembling data for a target appraisal area. Little needs to be known about the target area other than area or volume of sedimentary rock. However, the more that is known about the geology, the easier and arguably better (supposedly) is the determination of an appropriate yield factor. Much of the work, actually, is in compiling suitable analog yields, which must be done at the same scale (basin, play) as the target. The primary disadvantage lies in the difficulty in assigning appropriate yield factors even when the geology is very well known. The relationship between yield factor and the many underlying geologic factors is obviously very complex, so appraisals done by this method are likely to be cruder than those done by methods that more directly involve more of the geologic constraints. The calculations may serve as an appropriate check, however, on appraisals done by other methods.

Major references include Hendricks (1965, 1974), Jones (1975), Mallory (1975a), Ulmishek and Harrison (1984), and Weeks (1965, 1966a).

Field-size distributions

The assumption of an underlying distribution of field sizes can be used to generate estimates. Given an assumed distribution (for example, lognormal or Pareto) and the sizes of discovered fields, sizes of undiscovered fields can be estimated. Considerably more data is required than for areal or volumetric yield calculations. Sizes of discovered fields (or reservoirs, if done on that scale) are necessary. Since a substantial number of fields (at least 20?) are needed to give a reasonable fit of the data to a distribution, this is inappropriate for nonproducing or immature plays.

The major assumption of a particular analysis by this method is the choice of which distribution to use. Field distributions are clearly skewed, having few large fields and many smaller ones, but whether there is a modal size (as in a lognormal distribution) or whether the number of small fields continues to increase with decreasing size (as in a Pareto distribution) is the subject of considerable debate.

For mature areas with a sufficiently large number of discoveries, the field-size distribution is usually fairly well behaved and this method can give good results. Generally, though, the inclusion of discovery order information in a discovery process model improves the results even more. In any case, exploration constraints can in some cases have significant impact on the results if not accounted for separately. Since a large number of discovered fields is required, this method is inappropriate for hypothetical or immature plays. The quality of the assessment also relies on the quality of the sizes of discovered fields, which should probably be grown to ultimate size. The difficulty in doing so may impact the assessment quality.

Major references include Harbaugh and Ducastaing (1981), Houghton (1988), Howarth and others (1980), Kaufman (1963), Klemme (1983, 1984), McCrossan (1969), Riesz (1978), and Schuenemeyer and Drew (1983).

Historical extrapolation

Historical extrapolation methods relate discovery data to order of discovery, to time, or to some measure of exploratory effort. One such method is the analysis of the number of discoveries per unit time or effort, extrapolated into the future using some mathematical function. Discovery process modeling is even more complex in that it extrapolates both numbers and sizes of accumulations from the past into the future. Data requirements are either the order of discovery of the deposits or their discovery dates, depending on the particular method used. A measure of the exploratory effort with time (for example, the number of wildcat wells drilled per year) and the sizes of the accumulations are also required for some of the methods.

An underlying model of discovery requires the assumption of some particular mathematical function for extrapolation into the future. In discovery process modeling, the assumption of a particular field-size distribution may also be required.

As in field-size distribution methods, sufficiently large data sets are usually well behaved, but exploration constraints must be separately accounted for. Again, since a

large number of discovered accumulations is required, this method is inappropriate for hypothetical or immature plays.

Major references include Arps and Roberts (1958), Barouch and Kaufman (1976a, b), Drew (1975a), Drew and others (1980), Hubbert (1967), Kaufman and others (1975), Meisner and Demiren (1981), Moore (1966a), Root and Drew (1979), Root and Schuenemeyer (1980), J.T. Ryan (1973a), and Zapp (1962).

Deposit modeling

Deposit modeling involves a volumetric model of individual prospects or groups of prospects. The methods consist of generating and then combining estimates of the number of undiscovered deposits and estimates of the sizes of undiscovered deposits. Often the estimates of sizes of undiscovered deposits are calculated using geologic data, such as structure sizes, reservoir thicknesses, and porosities, in a volumetric equation. The deposit size estimates may also come directly from analog deposit size data or from a combination of deposit size and historical data by way of a discovery process model. Risk is likely to be assessed separately. This method is often referred to as play analysis, but can be done at a variety of scales. Data requirements are relatively heavy, depending particularly on what variables are used to calculate the accumulation sizes.

In most of the methods of this category, assumptions must be made about dependence among variables (both size variables and risk elements).

For geologist appraisers, this method has the advantage of dealing with the sorts of data with which a geologist is most comfortable: sizes of structures, reservoir thicknesses, porosities, etc. Some variables, such as trap fill, are very difficult to assess, however. Much data is needed and, when volumetric equations for accumulation size are used, there are serious questions about dependence among variables. Perhaps the largest disadvantage is a tendency to not adequately cover hypothetical plays.

Major references include Baker and others (1984), Bird (1984b), Energy, Mines and Resources Canada (1977), Lee and Wang (1983a, b), Miller (1981, 1982a), Procter and Taylor (1984), and L.P. White (1981).

Organic geochemical mass balance

The organic geochemical mass balance or material balance approach (volume genetic approach of the Russian literature) begins by assessing an amount of generated hydrocarbon then modifying that amount to estimate amounts migrated, leaked and

eventually trapped. Data requirements are particularly large and difficult to fulfill. Much quantitative geochemical data is required.

Assumptions include not only those related to the geochemistry of hydrocarbon generation, but also the assumption that all the significant source rocks have been identified and adequately analyzed and characterized.

This method has the advantage of dealing with the fundamental geologic processes in oil and gas occurrence by following the temporal progression of the hydrocarbon generation, migration, and accumulation. Sufficient geochemical data may appropriately constrain the estimate of generated hydrocarbons for those source rocks examined. However, the quantitative proportioning of generated hydrocarbons being expelled, leaked, dispersed, or trapped is presently very poorly understood. The proportion of trapped hydrocarbon seems to be a low percent of that generated, and small changes in the efficiencies of migration or entrapment result in large changes in the estimates of trapped hydrocarbons. This method is most useful in frontier areas where there is little constraining information available from discovery histories and as a qualitative approach to help investigate scenarios of hydrocarbon history and distribution. A further disadvantage of this method is the relatively large amount of work needed to assemble and analyze data.

Major references include Bishop and others (1983), Conybeare (1965), Kontorovich (1950, 1976, 1984), and Neruchev (1964).

Direct expert assessment

Direct expert assessment is sometimes called direct subjective assessment. Methods in this category include Delphi conferences. As all assessments must be based on some sorts of constraints, these methods are actually indirect in that they rely on other methods, either explicitly or implicitly. The open structure allows such methods to be used for assessments based on any amount of data, large or small.

Direct expert assessment has few constraints, and thus few underlying assumptions other than general geologic theories of petroleum occurrence that are shared by all the methods.

Because the assessor or assessors are not tightly constrained, there is more room for assessor bias to enter into the assessment. Effectiveness depends, to a large extent, on the knowledge and objectivity of the individual assessor(s). On the other hand, the lack of constraints, allows the assessor(s) to take into account special situations such as

exploration constraints that are poorly handled by more mechanical methods. The particular strength of direct assessment methods is its ability to synthesize disparate information and the results of more mechanical methods and to modify them to account for the particulars of specific subject areas.

Major references include Baxter and others (1978), Dolton (1984), Dolton and others (1981), Houghton and others (1993), Ivanhoe (1986a), and Miller and others (1975).

OTHER ANNOTATIONS

Mathematical tools

A number of statistical and mathematical techniques as well as a number of computer programs have been developed to assist and perform resource appraisals. Included here are probabilistic methods to calculate estimates, either using Monte Carlo techniques or more direct equations. Also included are techniques to aggregate estimates of smaller areas into estimates for larger areas or to disaggregate estimates of larger areas into estimates for smaller areas.

Major references include Crovelli (1981, 1985b), and Crovelli and Balay (1986, 1990a).

Reserve growth/confirmation

The methods discussed previously were for assessing undiscovered accumulations of oil or gas. A related problem is the estimation of resources in discovered fields beyond what is currently proven. This quantity is the difference between the presently known accumulation size (cumulative production plus proved reserves) and the ultimate size of the field at exhaustion. Calculation of inferred resources for an individual field is an engineering calculation not treated in this bibliography. Inferred resources, however, can also be estimated at an aggregate level and such methods are included in this category. Especially in maturely explored areas, the amount of inferred resources can exceed the amount of undiscovered resources.

Major references include Arrington (1960), Attanasi and Root (1994), Mast and Dingler (1975), Root (1981), and Root and Mast (1993).

Quantitative characterization of undiscovered resources

Besides just the size, quantitative estimation of other aspects of undiscovered resources is also of interest. Most common of these are economic models based on the geologic characterization. Other methods may characterize the undiscovered accumulations geologically, for example by depth.

Major references include Attanasi and others (1993), Attanasi and Haynes (1984), Baturin and others (1990), Bugg and others (1988), and Sverchkov and Ivanova (1985).

GENERAL REFERENCES

For purposes of general reference, especially for those beginning their investigations into resource appraisal methodology, we submit the following list of what we consider some of the best all-purpose references.

Adelman, M.A., Houghton, J.C., Kaufman, Gordon, and Zimmerman, M.B., 1983, Energy resources in an uncertain future--Coal, gas, oil, and uranium supply forecasting: Cambridge, Mass., Ballinger Publishing Co., 434 p.

Buyalov, N.I., ed., 1990, Metodicheskiye osnovy prognozirovaniya neftegazonosnosti [Methodological basis of oil and gas resource assessment]: Moscow, Nedra, 248 p.

Drew, L.J., 1990, Oil and gas forecasting--Reflections of a petroleum geologist: New York, Oxford University Press, International Association for Mathematical Geology Studies in Mathematical Geology, no. 2, 252 p.

Haun, J.D., ed., 1975, Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology 1, 206 p.

Masters, C.D., ed., 1984, Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, 157 p.

Rice, D.D., ed., 1986, Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, 267 p.

White, D.A., and Gehman, H.M., 1979, Methods of estimating oil and gas resources: American Association of Petroleum Geologists Bulletin, v. 63, no. 12, p. 2183-2192.

SOLICITATION

The utility of a resource such as this bibliography depends to a large extent on its completeness. No author or small group of authors can be aware of every reference for any but the most narrow of topics. In the interest of future updates to this bibliography we therefore solicit contributions of omitted references. Please contact any of the authors at:

U.S. Geological Survey
Box 25046, DFC, MS 940

Denver, Colorado 80225, U.S.A.

REFERENCES

Abrahamsen, K.A., 1989, Application of the resource estimation program FASPUM; Experiences from offshore Norway, appendixes 14 and 15 *of* Sixth meeting of the Working Group on Resource Assessment, Bangkok, Thailand, September, 1989 [Proceedings]: Bangkok, [United Nations] Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP), CCOP Technical Secretariat, variously paginated [44 p.].

Deposit modeling

Abramovich, M.V., 1960, Estimate of reserves of prospective areas in folded oil and gas regions: Petroleum Geology, v. 4, no. 6-A, p. 315-318.

Deposit modeling

Abrikosov, I.Kh., and Beylin, A.M., 1983, K metodologii kolichestvennogo prognozirovaniya effektivnosti poiskovo-razvedochnykh rabot na neft i gaz [On the methodology for quantitative prediction of the efficiency of exploration for oil and gas]: Geologiya Nefti i Gaza, 1983, no. 12, p. 44-49.

Historical extrapolation

Abrikosov, I.Kh., and Beylin, A.M., 1985, Prognozirovaniye vyiavlyaemosti mestorozhdeniy nefti i gaza [Forecast of discovery of oil and gas fields]: Geologiya Nefti i Gaza, 1985, no. 11, p. 7-14.

Field-size distributions, historical extrapolation

Abrikosov, I.Kh., and Beylin, A.M., 1986, Stokhasticheskiy podkhod k prognozirovaniyu effektivnosti poiskovo-razvedochnykh rabot na neft i gaz [Stochastic approach to prediction of the efficiency of exploration for oil and gas], *in* Bakirov, A.A., Sudarikov, Yu.A., and Marasanova, N.V., eds., Problemy neftegazogeologicheskogo prognozirovaniya [Problems of petroleum geology prognostication]: Moscow, Nauka, p. 29-36.

Historical extrapolation

Adams, T.D., and Kirkby, M.A., 1975, Estimate of world gas reserves, *in* World Petroleum Congress, 9th, Tokyo, 1975, Proceedings: London, Applied Science Publishers, v. 3, p. 3-9.

Reserve growth/confirmation

Adelman, M.A., Houghton, J.C., Kaufman, Gordon, and Zimmerman, M.B., 1983, Energy resources in an uncertain future--Coal, gas, oil, and uranium supply forecasting: Cambridge, Mass., Ballinger Publishing Co., 434 p.

Areal and volumetric yields, historical extrapolation, deposit modeling, direct expert assessment

Agterberg, F.P., 1980, Mineral resource estimation and statistical exploration, *in* Miall, A.D., ed., Facts and principles of world petroleum occurrence: Canadian Society of Petroleum Geologists Memoir 6, p. 301-318.

Historical extrapolation

Akramkhodzhayev, A.M., Kirshin, A.V., and Amirkhanov, Sh.Kh., 1989, Rol sorbirovannykh uglevodorodov rasseyannogo organicheskogo veshchestva osadochnykh porod v otsenke prognoznykh resurov nefti i gaza [Role of absorbed hydrocarbons in dispersed organic matter of sedimentary rocks in assessment of undiscovered oil and gas resources], *in* Trofimuk, A.A., ed., Otsenka prognoznykh resursov nefti v svete ucheniya akademika I.M. Gubkina [Assessment of undiscovered oil resources in light of theories of academician I.M. Gubkin]: Novosibirsk, Russia, Nauka, p. 42-56.

Organic-geochemical mass balance

Alexander, R.G., Jr., 1984, Importance of people in resource assessment [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 447-448.

Direct expert assessment

Allen, P.A., and Allen, J.R., 1990, Basin analysis--Principles and applications: Oxford, Blackwell Scientific Publications, 451 p.

Deposit modeling, organic geochemical mass balance

AAPG Strategic Committee on Public Affairs [1976], The assessment of undiscovered petroleum resources: American Association of Petroleum Geologists Background Paper 8, 5 p.

Areal and volumetric yields

Andreatta, G., Kaufman, G.M., McCrossan, R.G., and Procter, R.M., 1988, The shape of Lloydminster oil and gas deposit attribute data, *in* Chung, C.F., Fabbri, A.G., and Sinding-Larsen, R., eds., Quantitative analysis of mineral and energy resources: Dordrecht, Holland, D. Reidel Publishing, NATO ASI Series C, Mathematical and Physical Sciences, v. 223, p. 411-431.

Field-size distributions

Arps, J.J., Mortada, M., and Smith, A.E., 1971, Relationship between proved reserves and exploration effort: Journal of Petroleum Technology, v. 23, no. 6, p. 671-675.

Areal and volumetric yields, historical extrapolation, reserve growth/confirmation

Arps, J.J., and Roberts, T.G., 1958, Economics of drilling for Cretaceous oil on east flank of Denver-Julesburg Basin: American Association of Petroleum Geologists Bulletin, v. 42, no. 11, p. 2549-2566.

Historical extrapolation

Arrington, J.R., 1960, Predicting the size of crude reserves is key to evaluating exploration programs: Oil and Gas Journal, v. 58, no. 9, p. 130-134.

Reserve growth/confirmation

Arrington, J.R., 1966, Estimation of future reserve revision in current fields, *in* Economics and the Petroleum Geologist, Symposium, Midland, Tex., 1966, Transactions: Midland, Tex., West Texas Geological Society Publication 66-53, p. 16-30.

Reserve growth/confirmation

Arsiriy, Yu.A., Kabyshev, B.P., Chuprynin, D.I., Shevchenko, A.F., and Shevyakova, Z.P., 1986, Prognoz razmerov i chisla heotkrytykh zalezhey UV i metodika ikh poiskov v DDV [Forecast of the number and sizes of undiscovered hydrocarbon pools and method for their exploration in the Dneiper-Donets depression]: Geologiya Nefti i Gaza, 1986, no. 10, p. 42-46.

Field-size distributions

Arutyunyan, R.M., Azamatov, V.I., and Khalimov, E.M., 1992, Metodika otsenki podtverzhdaemosti zapasov nefti kategorii C_2 (na primere Zapadnoy Sibiri) [Method for assessment of confirmation of oil reserves of the C_2 category (an example from West Siberia)]: Geologiya Nefti i Gaza, 1992, no. 6, p. 28-31.

Reserve growth/confirmation

Ashton, P.R., 1981, Estimating potential reserves in Southeast Asian Neogene reefs, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 244-259.

Deposit modeling

Attanasi, E.D., Bird, K.J., and Mast, R.F., 1993, Economics and the National Oil and Gas Assessment--The case of onshore northern Alaska: American Association of Petroleum Geologists Bulletin, v. 77, no. 3, p. 491-504.

Quantitative characterization of undiscovered resources

Attanasi, E.D., and Drew, L.J., 1985, Lognormal field size distributions as a consequence of economic truncation: Journal of the International Association for Mathematical Geology, v. 17, no. 4, p. 335-351.

Field-size distributions, historical extrapolation

Attanasi, E.D., and Drew, L.J., 1990, Economic implications of petroleum field size distributions: Energy Exploration and Exploitation, v. 8, no. 3, p. 245-257.

Field-size distributions, quantitative characterization of undiscovered resources

Attanasi, E.D., Drew, L.J., and Root, D.H., 1981, Physical variables and the petroleum discovery process, *in* Ramsey, J.B., ed., The economics of exploration for energy resources: Greenwich, Conn., Jai Press, p. 3-18.

Historical extrapolation

Attanasi, E.D., Drew, L.J., and Schuenemeyer, J.H., 1980, Petroleum-resource appraisal and discovery rate forecasting in partially explored regions--An application to supply modeling: U.S. Geological Survey Professional Paper 1138-C, 20 p.

Historical extrapolation

Attanasi, E.D., Garland, T.M., Wood, J.H., Dietzman, W.D., and Hicks, J.N., 1981, Economics and resource appraisal--The case of the Permian Basin: Journal of Petroleum Technology, v. 33, no. 4, p. 603-616. [reprinted from Hydrocarbon Economics and Evaluation Symposium, 8th, Dallas, Tex., 1979, Papers: SPE 7738].

Historical extrapolation

Attanasi, E.D., and Haynes, J.L., 1983a, Economics and the appraisal of conventional oil and gas resources in the western Gulf of Mexico, *in* SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, Tex., 1983, Proceedings: Dallas, Tex., Society of Petroleum Engineers of AIME, SPE 11297, p. 83-94.

Historical extrapolation

Attanasi, E.D., and Haynes, J.L., 1983b, Future supply of oil and gas from the Gulf of Mexico: U.S. Geological Survey Professional Paper 1294, 21 p.

Historical extrapolation

Attanasi, E.D., and Haynes, J.L., 1984, Economics and appraisal of conventional oil and gas in the western Gulf of Mexico: Journal of Petroleum Technology, v. 36, no. 13, p. 2171-2180.

Historical extrapolation, quantitative characterization of undiscovered resources

Attanasi, E.D., and Root, D.H., 1981, Petroleum potential of Latin America and Africa from a global perspective: Oil and Gas Journal, v. 79, no. 44, p. 187-205.

Historical extrapolation

Attanasi, E.D., and Root, D.H., 1988a, Forecasting petroleum discoveries in sparsely drilled areas--Nigeria and the North Sea: Mathematical Geology, v. 20, no. 7, p. 763-776.

Historical extrapolation

Attanasi, E.D., and Root, D.H., 1988b, Small field oil and gas resource estimation for the National Assessment, *in* Carter, L.M.H., ed., USGS research on energy resources, 1988--Program and abstracts: U.S. Geological Survey Circular 1025, p. 1.

Field-size distributions

Attanasi, E.D., and Root, D.H., 1994, The enigma of oil and gas field growth: American Association of Petroleum Geologists Bulletin, v. 78, no. 3, p. 321-332.

Reserve growth/confirmation

Attanasi, E.D., and Schuenemeyer, J.H., 1989, Robustness of disaggregate oil and gas discovery forecasting models: Marine and Petroleum Geology, v. 6, no. 3, p. 270-276.

Historical extrapolation

Atwater, G.I., 1956, Future of Louisiana offshore oil province: American Association of Petroleum Geologists Bulletin, v. 40, no. 11, p. 2624-2634.

Deposit modeling

Baecher, G.B., 1975, Subjective sampling approaches to resource estimation, *in* Grenon, M., ed., First IIASA Conference on Energy Resources, May 1975 [Proceedings]: Laxenburg, Austria, International Institute for Applied Systems Analysis, p. 251-274. [Reprinted in Grenon, Michel, ed., 1979, Methods and models for assessing energy resources--IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 186-209.]

Historical extrapolation

Baker, R.A., 1988, When is a prospect or play played out?: Oil and Gas Journal, v. 86, no. 2, p. 77-80.

Historical extrapolation

Baker, R.A., Gehman, H.M., James, W.R., and White, D.A., 1984, Geologic field number and size assessments of oil and gas plays: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 426-437.

Field-size distributions, deposit modeling

Baker, R.A., Gehman, H.M., James, W.R., and White, D.A., 1986, Geologic field number and size assessments of oil and gas plays, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 25-31.

Field-size distributions, deposit modeling

Bakirov, A., and Ovanessov, Sc. G., 1971, Scientific principles of calculation of potential oil and gas resources in connection with their evaluation in estimating different

prospective oil and gas provinces, *in* World Petroleum Congress, 8th, Moscow, 1971, Proceedings: London, Applied Science Publishers, v. 2, p. 315-322.

Areal and volumetric yields, historical extrapolation, deposit modeling, organic geochemical mass balance

Bakirov, V.A., 1984, Nekotorye metodicheskiye aspekty analiza kontsentratsii zapasov mestorozhdeniy (zalezhey) uglevodorodov [Some methodological aspects of analysis of the concentration of hydrocarbon reserves in fields (pools)], *in* Bakirov, A.A., and Marasanova, N.V., eds., Problemy kolichestvennogo prognozirovaniya neftegazonosnosti nedr [Problems in quantitative prediction of amounts of oil and gas in the subsurface]: Moscow, Nauka, p. 129-135.

Field-size distributions

Barouch, E., and Kaufman, G.M., 1975a, Predicting undiscovered oil and gas in a play using a stochastic model of discovery, *in* Davis, J.C., Doveton, J.H., and Harbaugh, J.W., convenors, Probability methods in oil exploration; American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1975, Notes: Lawrence, Kans., Kansas Geological Survey, 7 p. (variously paged).

Historical extrapolation

Barouch, E., and Kaufman, G.M., 1975b, A probabilistic model of oil and gas discovery, *in* Grenon, M., ed., First IIASA Conference on Energy Resources, May 1975 [Proceedings]: Laxenburg, Austria, International Institute for Applied Systems Analysis, p. 311-324. [Reprinted in Grenon, Michel, ed., 1979, Methods and models for assessing energy resources--IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 248-260.]

Field-size distributions, historical extrapolation

Barouch, E., and Kaufman, G.M., 1976a, Oil and gas discovery modeled as sampling proportional to random size: Cambridge, Mass., Massachusetts Institute of Technology, Alfred P. Sloan School of Management Working Paper 888-76, 64 p.

Historical extrapolation

Barouch, E., and Kaufman, G.M., 1976b, Probabilistic modelling of oil and gas discovery, *in* Roberts, F.S., ed., Mathematics and models: Philadelphia, Society for Industrial and Applied Mathematics, p. 133-152.

Historical extrapolation

Barouch, E., and Kaufman, G.M., 1977, Estimation of undiscovered oil and gas, *in* Mathematical aspects of production and distribution of energy--American Mathematical Society, Symposium in Applied Mathematics, San Antonio, Tex., 1976, Proceedings: Providence, R.I., American Mathematical Society, v. 21, p. 77-91.

Historical extrapolation

Barouch, E., and Kaufman, G.M., 1978, The interface between geostatistical modeling of oil and gas discovery and economics: Mathematical Geology, v. 10, no. 5, p. 611-627.

Historical extrapolation, deposit modeling

Barouch, Eytan, Kaufman, G.M., and Nelligan, John, 1983, Estimation of parameters of oil and gas discovery process models using the expectation-maximization algorithm, in Kydes, A.S., Agrawal, A.K., Rahman, S., Vichnevetsky, R., and Ames, W.F., eds., Energy modeling and simulation: New York, North-Holland Publishing, p. 109-117.

Historical extrapolation

Barss, D.L., 1978, The significance of petroleum resource estimates and their relation to exploration: Bulletin of Canadian Petroleum Geology, v. 26, no. 2, p. 275-291.

Areal and volumetric yields, historical extrapolation, deposit modeling, direct expert assessment

Barss, D.L., 1980, Conventional petroleum resource estimates--Methods of assessment and their implication for planning and policy issues, *in* Hobson, G.D., ed., Developments in petroleum geology--2: London, Applied Science Publishers, p. 299-338.

Areal and volumetric yields, field-size distributions, historical extrapolation, deposit modeling, reserve growth/confirmation

Baturin, Yu.N., Morozova, M.N., Komarova, T.V., Starchenkova, R.M., Sharapova, O.Yu., and Shumilova, M.B., 1990, Nekotorye resultaty geologo-ekonomicheskoy otsenki osvoeniya prognoznykh resursov nefti [Some results of geologic-economic assessment of development of undiscovered oil resources], *in* Khalimov, E.M., Azamatov, V.I., and Baturin, Yu.N., eds., Resursy nefti i gaza i effectivnoye ikh osvoeniye [Oil and gas resources and efficiency of their development]: Moscow, Institut Geologii i Razrabotki Goryuchikh Iskopaeniykh, p. 25-31.

Quantitative characterization of undiscovered resources

Baxter, G.G., Cargill, A.H.C., Hart, P.E., Kaufman, G.M., and Urquidi-Barrau, F., 1978, Workshop on the Delphi method: Journal of the International Association for Mathematical Geology, v. 10, no. 5, p. 581-587.

Direct expert assessment

Beckie, K.N., 1975, A probabilistic assessment of Alberta's undiscovered petroleum, *in* Davis, J.C., Doveton, J.H., and Harbaugh, J.W., convenors, Probability methods in

oil exploration--American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1975, Notes: Lawrence, Kans., Kansas Geological Survey, p. 7-11.

Historical extrapolation

Beebe, B.W., Murdy, R.J., and Rassinier, E.A., 1975, Potential Gas Committee and undiscovered supplies of natural gas in United States, *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 90-96.

Areal and volumetric yields

Belonin, M.D., Podolsky, Yu. V., and Rastyanene, V.P., 1986, Prognozirovaniye velichiny i struktury potentsialnykh resursov nefti i gaza i dinamika ikh vyiavleniya s ispolzovaniem geologo-matematicheskikh metodov i EVM [Prediction of the amounts and structure of potential oil and gas resources and the dynamics of discovery based on the application of geologic-mathematical methods and computers], *in* Bakirov, A.A., Sudarikov, Yu.A., and Marasanova, N.V., eds., Problemy neftegazogeologicheskogo prognozirovaniya [Problems of petroleum geology prognostication]: Moscow, Nauka, p. 14-29.

Historical extrapolation, mathematical tools

Berg, R.R., Calhoun, J.C., Jr., and, Whiting, R.L., 1974, Prognosis for expanded U.S. production of crude oil: Science, v. 184, no. 4134, p. 331-336.

Historical extrapolation

Beskow, K.M., and Ronnevik, H.C., 1981, Norwegian North Sea--A case history, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 260-262.

Deposit modeling

Bird, K.J., 1984a, A comparison of the play-analysis technique as applied in hydrocarbon resource assessments of the National Petroleum Reserve in Alaska and of the Arctic National Wildlife Refuge: U.S. Geological Survey Open-File Report 84-78, 18 p.

Deposit modeling

Bird, K.J., 1984b, A comparison of the play-analysis technique as applied in hydrocarbon resource assessments of the National Petroleum Reserve in Alaska and of the Arctic National Wildlife Refuge *in* Masters, C.D., ed., Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, p. 63-79.

Deposit modeling

Bird, K.J., 1986, A comparison of the play analysis technique as applied in hydrocarbon resource assessments of the National Petroleum Reserve in Alaska and the Arctic National Wildlife Refuge, *in* Rice, D.D., ed., Oil and gas assessment-methods and

applications: American Association of Petroleum Geologists Studies in Geology 21, p. 133-142.

Deposit modeling

Bishop, R.S., Gehman, H.M., Jr., and Young, Allen, 1983, Concepts for estimating hydrocarbon accumulation and dispersion: American Association of Petroleum Geologists Bulletin, v. 67, no. 3, p. 337-348. [Reprinted *in* Demaison, Gerald, and Murris, R.J., eds, 1984, Petroleum geochemistry and basin evaluation: American Association of Petroleum Geologists Memoir 35, p. 41-52.]

Organic geochemical mass balance

Bleie, Jakob, Oppeboen, K.A., and Nysaether, Eigill, 1982, The hydrocarbon potential of the northern Norwegian Shelf in the light of recent drilling, *in* The geologic framework and hydrocarbon potential of basins in the northern seas: Offshore Northern Seas Conference and Exhibition, Stavanger, Norway, 1982, v. 3, p. E/5-1 thru E/5-39.

Areal and volumetric yields

Bohling, G.C., and Davis, J.C., 1993, A Fortran program for Monte Carlo simulation of oil-field discovery sequences: Computers & Geosciences, v. 19, no. 10, p. 1529-1543.

Historical extrapolation, mathematical tools

Bois, C., Cousteau, A., Perrodon, A., and Pommier, G., 1980, Methodes d'estimation des reserves ultimes [Methods of estimation of ultimate reserves], *in* World Petroleum Congress, 10th, Bucharest, 1979, Proceedings: London, Heyden, v. 2, p. 279-289.

Field-size distributions, historical extrapolation, deposit modeling, organic geochemical mass balance

Borg, I.Y., 1975, Appraisal of current methods of evaluating crude oil resources: Livermore, Calif., University of California, Lawrence Livermore Laboratory UCRL-51848, 31 p.

Areal and volumetric yields, historical extrapolation, deposit modeling

Bostrikov, O.I., 1988, Sovershenstvovaniye metodiki otsenki masshtabov generatsii i emigratsii zhidkikh UV v mezozoyskikh otlozheniyakh Zapadno-Sibirskoy plity [Improvement of the method of assessment of the amounts of generated and migrated liquid hydrocarbons in Mesozoic rocks of the West Siberia plate]: Geologiya Nefti i Gaza, 1988, no. 6, p. 9-13.

Organic-geochemical mass balance

Bradley, P.G., 1971, Exploration models and petroleum production economics, *in* Adelman, M.A., Bradley, P.G., and Norman, C.A., Alaskan oil--Costs and supply: New York, Praeger Publishers, p. 94-122.

Field-size distributions, historical extrapolation, reserve growth/confirmation

Brashear, J.P., Morra, F., Everett, C., Murphy, F.H., Hery, W., and Ciliano, R., 1982, A prospect specific simulation model of oil and gas exploration in the outer continental shelf--Methodology, *in* Gass, S.I., ed., Oil and gas supply modeling (Symposium, Washington, 1980, Proceedings): National Bureau of Standards Special Publication 631, p. 688-738.

Deposit modeling

Brekke, Harald, 1989, Play analysis of the Norwegian North Sea 60°N-62° N, appendix 12 of Sixth meeting of the Working Group on Resource Assessment, Bangkok, Thailand, September 1989 [Proceedings]:Bangkok, [United Nations] Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP), CCOP Technical Secretariat, unpaginated [34 p.].

Deposit modeling

Brooks, J.R.V., 1981, Current status of UK exploration and estimation of undiscovered hydrocarbon on the UK continental shelf, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 203-217.

Deposit modeling

Bugg, Paul, Miller, Stanley, and White, L.P., 1988, Policy analyses of the National Petroleum Reserve in Alaska--Methods and applications, chap. 6 *of* Gryc, George, ed., Geology and exploration of the National Petroleum Reserve in Alaska, 1974 to 1982: U.S. Geological Survey Professional Paper 1399, p. 129-138.

Areal and volumetric yields, deposit modeling, quantitative characterization of undiscovered resources

Bultman, M.W., 1988, The use of basin classification and analog basins in petroleum resource assessment, *in* Carter, L.M.H., ed., USGS research on energy resources, 1988--Program and abstracts: U.S. Geological Survey Circular 1025, p. 6-7.

Areal and volumetric yields, field-size distributions

Buyalov, N.I., ed., 1990, Metodicheskiye osnovy prognozirovaniya neftegazonosnosti [Methodological basis of oil and gas resource assessment]: Moscow, Nedra, 248 p.

Areal and volumetric yields, field-size distributions, historical extrapolation, deposit modeling, organic geochemical mass balance, direct expert assessment, mathematical tools, reserve growth/confirmation, quantitative characterization of undiscovered resources

Buyalov, N.I., Erofeev, N.S., Kalinen, N.A., Kleschev, A.I., Kudryashova, N.M., L'vov, M.S., Simakov, S.N., and Vasil'ev, V.G., 1964, Metodika otsenki prognoznykh zapasov nefti i gaza [Quantitative evaluation of predicted reserves of oil and gas]: New York, Consultants Bureau Translation, 69 p.

Areal and volumetric yields, field-size distributions, deposit modeling, organic geochemical mass balance

Buyalov, N.I., and Nalivkin, V.D., eds., 1979, Metody otsenki perspektiv neftegazonosnosti [Methods of assessment of oil and gas potential]: Moscow, Nedra, 333 p.

Areal and volumetric yields, field-size distributions, historical extrapolation, deposit modeling, organic-geochemical mass balance, direct expert assessment, quantitative characterization of undiscovered resources

Buyalov, N.I., Vasil'yev, V.G., Elin, N.D., Yerofeyev, N.S., L'vov, M.S., Kleshchev, A.I., Kudryashova, N.M., and Sokolov, V.L., 1961, Method of estimating reserves of natural gas and oil: Petroleum Geology, v. 5, no. 1, p. 11-15.

Deposit modeling

Buyalov, N.I., and Zakharov, Ye.V., 1964, Use of the volume method for estimating prognostic reserves of oil: Petroleum Geology, v. 8, no. 7, p. 372-375.

Deposit modeling

Canada Department of Energy, Mines, and Resources, 1973, Energy reserves and potential resources, chap. 2, *of* An energy policy for Canada--Phase 1: Ottawa, The Minister of Energy, Mines, and Resources, v. 2, Appendices, p. 31-98.

Areal and volumetric yields, deposit modeling, direct expert assessment

Cargill, S.M., Meyer, R.F., Picklyk, D.D., and Urquidi, F., 1977, Summary of resource assessment methods resulting from the International Geological Correlation Programme Project 98: Journal of the International Association for Mathematical Geology, v. 9, no. 3, p. 211-220.

Areal and volumetric yields, deposit modeling, direct expert assessment

Carpenter, George, and Amato, Roger, 1991, Oil & gas potential of the Carolina trough--An evaluation of an undrilled offshore basin: U.S. Minerals Management Service, OCS Report MMS 91-0050, 28 p.

Deposit modeling

Century, J.R., 1980, Conventional petroleum assessments--Facts and fallacies, *in* Miall, A.D., ed., Facts and principles of world petroleum occurrence: Canadian Society of Petroleum Geologists Memoir 6, p. 283-300.

General

Charpentier, R.R., de Witt, Wallace, Jr., Claypool, G.E., Harris, L.D., Mast, R.F., Megeath, J.D., Roen, J.B., and Schmoker, J.W., 1982, Estimates of unconventional natural-gas resources of the Devonian shale of the Appalachian Basin: U.S. Geological Survey Open-File Report 82-474, 43 p.

Deposit modeling

Charpentier, R.R., de Witt, Wallace, Jr., Claypool, G.E., Harris, L.D., Mast, R.F., Megeath, J.D., Roen, J.B., and Schmoker, J.W., 1993, Estimates of unconventional natural gas resources of the Devonian shales of the Appalachian Basin, chap. N *of* Roen, J.B., and Kepferle, R.C., eds., Petroleum geology of the Devonian and Mississippian black shale of eastern North America: U.S. Geological Survey Bulletin 1909, p. N1-N14.

Deposit modeling

Charpentier, R.R., Law, B.E., and Prensky, S.E., 1989, Quantitative model for overpressured gas resources of the Pinedale anticline, Wyoming, *in* Law, B.E., and Spencer, C.W., eds., Geology of tight gas reservoirs in the Pinedale anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin 1886, p. I1-I13.

Deposit modeling

Charpentier, R.R., and Wesley, J.S., 1986, Annotated bibliography of methodology for assessment of undiscovered oil and gas resources, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 247-263.

General

Chaube, A.N., and Avasthi, D.N., 1981, Methodology and results of prognostic resource assessment of Indian basins, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 218-230.

Areal and volumetric yields, deposit modeling, organic geochemical mass balance

Chaves, H.A.F., and Lewis, M.E., 1994, From data gathering to resources assessment--A holistic view of petroleum geology: Nonrenewable Resources, v. 3, no. 1, p. 72-82.

General

Chen, H.C., and Fang, J.H., 1993, A new method for prospect appraisal: American Association of Petroleum Geologists Bulletin, v. 77, no. 1, p. 9-18.

Deposit modeling, mathematical tools

Chen, Zhuoheng, and Sinding-Larsen, Richard, 1994, Estimating number and field size distribution in frontier sedimentary basins using a Pareto model: Nonrenewable Resources, v. 3, no. 2, p. 91-95.

Field-size distributions

Cherniavsky, E.A., 1980, Long-range oil and gas forecasting methodologies--Literature survey: Upton, N.Y., Brookhaven National Laboratory Report BNL 51216, 22 p.

Historical extrapolation

Cherskii, N.V., and Tsarev, V.P., 1977 [1978], Estimating reserves in light of exploration for and extraction of natural gas from world ocean floor sediments: Soviet Geology and Geophysics (Geologiya i Geofizika), v. 18, no. 5, p. 21-31.

Organic geochemical mass balance

Choate, Raoul, McCord, J.P., and Rightmire, C.T., 1986, Assessment of natural gas from coalbeds by geologic characterization and production evaluation, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 223-245.

Deposit modeling

Clark, A.L., 1981, Introduction to the process of resource assessment, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 107-112.

Areal and volumetric yields, field-size distributions, historical extrapolation, organic geochemical mass balance

Claypool, G.E., Love, A.H., and Maughan, E.K., 1978, Organic geochemistry, incipient metamorphism, and oil generation in black shale members of Phosphoria Formation, western interior United States: American Association of Petroleum Geologists Bulletin, v. 62, no. 1, p. 98-120. [Reprinted in Demaison, Gerard, and Murris, R.J., eds., 1984, Petroleum geochemistry and basin evaluation: American Association of Petroleum Geologists Memoir 35, p. 139-158.]

Organic geochemical mass balance

Cleveland, C.J., 1992, Yield per effort for additions to crude oil reserves in the lower 48 United States, 1946-1989: American Association of Petroleum Geologists Bulletin, v. 76, no. 6, p. 948-958.

Historical extrapolation

Coburn, T.C., and Schuenemeyer, J.H., 1991, When are we really going to run out of oil and gas? Statistical, political, economic, and geoscientific issues: Mathematical Geology, v. 23, no. 3, p. 403-442.

General

Collins, D.R., 1985, Changes in drilling density and discovery rates through time: Journal of the International Association for Mathematical Geology, v. 17, no. 4, p. 375-393.

Historical extrapolation

Combs, E.J., 1971, Summary of future petroleum potential of region 8, Michigan basin, *in* Cram, I.H., ed., Future petroleum provinces of the United States--Their geology and potential: American Association of Petroleum Geologists Memoir 15, v. 2, p. 1121-1164.

Areal and volumetric yields

Conybeare, C.E.B., 1965, Hydrocarbon-generation potential and hydrocarbon-yield capacity of sedimentary basins: Bulletin of Canadian Petroleum Geology, v. 13, no. 4, p. 509-528.

Areal and volumetric yields, organic geochemical mass balance

Cook-Clark, Jennifer, 1983, World finding-rate studies--Crude oil: U.S. Geological Survey Open-File Report 83-715, 257 p.

Historical extrapolation

Cooke, L.W., 1985, Estimates of undiscovered, economically recoverable oil and gas resources for the outer continental shelf as of July 1984: U.S. Minerals Management Service, OCS Report MMS 85-0012, 45 p.

Deposit modeling

Cooke, L.W., and Dellagiarino, George, 1990, Estimates of undiscovered oil & gas resources for the outer continental shelf as of January 1987: U.S. Minerals Management Service, OCS Report MMS 89-0090, 115 p.

Deposit modeling

Cossey, S.P.J., and Jacobs, R.E., 1992, Oligocene Hackberry Formation of southwest Louisiana--Sequence stratigraphy, sedimentology, and hydrocarbon potential: American Association of Petroleum Geologists Bulletin, v. 76, no. 5, p. 589-606.

Field-size distributions, historical extrapolation

Coustau, Henri, 1979, Logique de distribution des tailles des champs dans les bassins [Field-size distribution in basins]: Petrole et Techniques, no. 262, p. 23-30.

Field-size distributions

Coustau, Henri, 1981, Habitat of hydrocarbons and field size distribution--A first step towards ultimate reserve assessment, *in* Assessment of undiscovered oil and gas--

Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 180-194.

Field-size distributions

Crandall, K.H., 1975, Estimating petroleum resources, *in* AGI's White House papers on earth science: Geotimes, v. 20, no. 9, p. 24.

Areal and volumetric yields

Crovelli, R.A., 1981, Probabilistic methodology for oil and gas resource appraisal: U.S. Geological Survey Open-File Report 81-1151, 77 p.

Mathematical tools

Crovelli, R.A., 1983a, Probabilistic methodology for petroleum resource appraisal of wilderness lands, chap. O *of* Miller, B.M., ed., Petroleum potential of wilderness lands in the western United States: U.S. Geological Survey Circular 902, p. O1-O5.

Mathematical tools

Crovelli, R.A., 1983b, Procedures for petroleum resource assessment used by the U.S. Geological Survey--Statistical and probabilistic methodology: U.S. Geological Survey Open-File Report 83-402, 23 p.

Mathematical tools

Crovelli, R.A., 1984a, Procedures for petroleum resource assessment used by the U.S. Geological Survey--Statistical and probabilistic methodology, *in* Masters, C.D., ed., Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, p. 24-38.

Mathematical tools

Crovelli, R.A., 1984b, U.S. Geological Survey probabilistic methodology for oil and gas resource appraisal of the United States: Mathematical Geology, v. 16, no. 8, p. 797-808.

Mathematical tools

Crovelli, R.A., 1985a, An analytic probabilistic methodology for resource appraisal of undiscovered oil and gas resources in play analysis: U.S. Geological Survey Open-File Report 85-657, 51 p.

Deposit modeling

Crovelli, R.A., 1985b, Comparative study of aggregations under different dependency assumptions for assessment of undiscovered recoverable oil resources in the world: Journal of the International Association for Mathematical Geology, v. 17, no. 4, p. 367-374.

Mathematical tools

Crovelli, R.A., 1986, U.S. Geological Survey quantitative petroleum resource appraisal methodologies, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 69-76.

Historical extrapolation, direct expert assessment

Crovelli, R.A., 1987, Probability theory versus simulation of petroleum potential in play analysis, *in* Albin, S.L., and Harris, C.M., eds., Statistical and computational issues in probability modeling, Part 1: Annals of Operations Research, v. 8, p. 363-381.

Deposit modeling, mathematical tools

Crovelli, R.A., 1988a, Multi-model approach to petroleum resource appraisal using analytic methodologies for probabilistic systems: Mathematical Geology, v. 20, no. 8, p. 955-972.

Areal and volumetric yields, deposit modeling, direct expert assessment

Crovelli, R.A., 1988b, U.S. Geological Survey assessment methodology for estimation of undiscovered petroleum resources in play analysis of the Arctic National Wildlife Refuge, *in* Chung, C.F., Fabbri, A.G., and Sinding-Larsen, R., eds., Quantitative analysis of mineral and energy resources: Dordrecht, Holland, D. Reidel Publishing, NATO ASI Series C, Mathematical and Physical Sciences, v. 223, p. 145-160.

Deposit modeling

Crovelli, R.A., 1992, Probabilistic methodology for estimation of undiscovered petroleum resources in play analysis of the United States: Nonrenewable Resources, v. 1, no. 2, p. 153-162.

Deposit modeling, mathematical tools

Crovelli, R.A., 1993, Probability and statistics for petroleum resource assessment: U.S. Geological Survey Open-File Report 93-582, 143 p.

Mathematical tools

Crovelli, R.A., and Balay, R.H., 1984, Computer program directory for petroleum assessment of wilderness lands in the western United States: U.S. Geological Survey Open-File Report 84-275, 14 p.

Mathematical tools

Crovelli, R.A., and Balay, R.H., 1986, FASP, an analytic resource appraisal program for petroleum play analysis: Computers & Geosciences, v. 12, no. 4B, p. 423-475.

Deposit modeling, mathematical tools

Crovelli, R.A., and Balay, R.H., 1987, FASPUM metric version--Analytic petroleum resource appraisal microcomputer programs for play analysis using a reservoir-engineering model: U.S. Geological Survey Open-File Reports 87-414A and B, 14 p. and one 5.25-inch diskette.

Deposit modeling, mathematical tools

Crovelli, R.A., and Balay, R.H., 1988a, A microcomputer application in oil and gas resource appraisal [abs.]: COGS Computer Contributions, v. 4, no. 3, p. 127.

Deposit modeling, mathematical tools

Crovelli, R.A., and Balay, R.H., 1988b, A microcomputer program for oil and gas resource appraisal: COGS Computer Contributions, v. 4, no. 3, p. 108-122.

Deposit modeling, mathematical tools

Crovelli, R.A., and Balay, R.H., 1989, FASPUE English version--Analytic petroleum resource appraisal microcomputer programs for play analysis using a reservoir-engineering model: U.S. Geological Survey Open-File Reports 89-1A and B, 15 p. and one 5.25-inch diskette.

Deposit modeling, mathematical tools

Crovelli, R.A., and Balay, R.H., 1990a, FASPU English and metric version--Analytic petroleum resource appraisal microcomputer programs for play analysis using a reservoir-engineering model: U.S. Geological Survey Open-File Reports 90-509A and B, 23 p. and one 5.25-inch diskette.

Deposit modeling, mathematical tools

Crovelli, R.A., and Balay, R.H., 1990b, PROBDIST--Probability distributions for modeling and simulation in the absence of data: U.S. Geological Survey Open-File Reports 90-446A and B, 51 p. and one 5.25-inch diskette.

Mathematical tools

Crovelli, R.A., and Balay, R.H., 1991, A microcomputer program for energy assessment and aggregation using the triangular probability distribution: Computers & Geosciences, v. 17, no. 2, p. 197-225.

Mathematical tools

Crovelli, R.A., and Balay, R.H., 1992a, APRAS--Analytic Petroleum Resource Appraisal System--Microcomputer programs for play analysis using a field-size model: U.S. Geological Survey Open-File Reports 92-21A and B, 30 p. and one 5.25-inch diskette.

Deposit modeling, mathematical tools

Crovelli, R.A., and Balay, R.H., 1992b, LOGRAF--Lognormal graph for resource assessment forecast: U.S. Geological Survey Open-File Reports 92-679A and B, 30 p. and one 5.25-inch diskette.

Mathematical tools

Crovelli, R.A., and Barton, C.C., 1993, Fractals and the Pareto distribution applied to petroleum accumulation-size distributions: U.S. Geological Survey Open-File Report 91-18, 29 p.

Field-size distributions

Dahlberg, E.C., 1980, Pros and cons of Zipf's Law as a resource appraisal tool [abs.], *in* Miall, A.D., ed., Facts and principles of world petroleum occurrence: Canadian Society of Petroleum Geologists Memoir 6, p. 987.

Field-size distributions

Davis, J.C., 1988, Statistical evaluation of petroleum deposits before discovery, *in* Chung, C.F., Fabbri, A.G., and Sinding-Larsen, R., eds., Quantitative analysis of mineral and energy resources: Dordrecht, Holland, D. Reidel Publishing, NATO ASI Series C, Mathematical and Physical Sciences, v. 223, p. 161-186.

Field-size distributions, deposit modeling

Davis, J.C., and Chang, Ted, 1989, Estimating potential for small fields in mature petroleum province: American Association of Petroleum Geologists Bulletin, v. 73, no. 8, p. 967-976.

Field-size distributions

Davis, J.C., and Harbaugh, J.W., 1980, Oil and gas in offshore tracts--Inexactness of resource estimates prior to drilling: Science, v. 209, no. 4460, p. 1047-1048.

Deposit modeling

Davis, J.C., and Harbaugh, J.W., 1981a, A method for rapid evaluation of oil and gas prospects in OCS regions: [Lawrence, Kans., Kansas Geological Survey] prepared for the U.S. Geological Survey under contract no. 14-08-001-18785 , 62 p. [Available for viewing at the U.S. Geological Survey Library, Reston, Va.]

Deposit modeling

Davis, J.C., and Harbaugh, J.W., 1981b, A simulation model for oil exploration on Federal lands of the U.S. outer continental shelves, *in* Ramsey, J.B., ed., The economics of exploration for energy resources: Greenwich, Conn., Jai Press, p. 19-50.

Deposit modeling, direct expert assessment

Davis, J.C., and Harbaugh, J.W., 1983a, Statistical appraisal of seismic prospects in Louisiana and Texas outer continental shelf: American Association of Petroleum Geologists Bulletin, v. 67, no. 3, p. 349-358.

Deposit modeling

Davis, J.C., and Harbaugh, J.W., 1983b, Statistical evaluation of oil and gas prospects in the outer continental shelf of the U.S. Gulf Coast [abs.]: Journal of the International Association for Mathematical Geology, v. 15, no. 1, p. 217.

Deposit modeling

Davis, W.B., 1965, The enigma of oil and gas finding costs, *in* Symposium on Petroleum Economics and Evaluation, 3d, Dallas, Tex., 1965, Papers: Society of Petroleum Engineers of AIME, Dallas Section, p. 19-27.

Reserve growth/confirmation

DeGolyer, Everette, 1951, On the estimation of undiscovered oil reserves: Journal of Petroleum Technology, v. 3, no. 1, p. 9-10.

Areal and volumetric yields

Demaison, Gerard, and Huizinga, B.J., 1991, Genetic classification of petroleum systems: American Association of Petroleum Geologists Bulletin, v. 75, no. 10, p. 1626-1643.

Organic geochemical mass balance

Demenchuk, V.M., and Movshovich, E.B., 1985, Opredeleniye veroyatnostnykh kharakteristik otsenki nachalnykh summarnykh isvelekayemykh resursov nefti i gaza [Identification of characteristics of the probability of assessment of total original recoverable resources of oil and gas]: Geologiya Nefti i Gaza, 1985, no. 4, p. 31-36.

Mathematical tools

Dix, S.M., 1977, The petroleum figures, *in* Energy, a critical decision for the United States economy: Grand Rapids, Mich., Energy Education Publishers, p. 63-103.

Historical extrapolation

Dolton, G.L., 1984, Basin assessment methods and approaches in the U.S. Geological Survey, *in* Masters, C.D., ed., Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, p. 4-23. [Reprinted in Foster, N.H., and Beaumont, E.A., comps., 1987, Evaluation, resource appraisal and world occurrence of oil and gas--Geologic basins II: American Association of Petroleum Geology, Treatise of Petroleum Geology Series, no. 2, p. 315-334.]

Areal and volumetric yields, historical extrapolation, deposit modeling, organic geochemical mass balance, direct expert assessment

Dolton, G.L., Bird, K.J., and Crovelli, R.A., 1987, Assessment of in-place oil and gas resources, chap. 22 *of* Bird, K.J., and Magoon, L.B., eds., Petroleum geology of the northern part of the Arctic National Wildlife Refuge, northeastern Alaska: U.S. Geological Survey Bulletin 1778, p. 277-298.

Deposit modeling

Dolton, G.L., Carlson, K.H., Charpentier, R.R., Coury, A.B., Crovelli, R.A., Frezon, S.E., Khan, A.S., Lister, J.H., McMullin, R.H., Pike, R.S., Powers, R.B., Scott, E.W., and Varnes, K.L., 1981, Estimates of undiscovered recoverable conventional resources of oil and gas in the United States: U.S. Geological Survey Circular 860, 87 p.

Areal and volumetric yields, historical extrapolation, deposit modeling, organic geochemical mass balance, direct expert assessment, mathematical tools, reserve growth/confirmation

Dolton, G.L., Coury, A.B., Frezon, S.E., Robinson, Keith, Varnes, K.L., Wunder, J.M., and Allen, R.W., 1979, Estimates of undiscovered oil and gas, Permian Basin, west Texas and southeast New Mexico: U.S. Geological Survey Open-File Report 79-838, 118 p.

Areal and volumetric yields, field-size distributions, historical extrapolation, direct expert assessment, mathematical tools

Dolton, G.[L.], and Crovelli, R.A., 1992, Resource assessment methodology for deep natural gas resources, *in* Dyman, T.S., ed., Geologic controls and resource potential of natural gas in deep sedimentary basins in the United States: U.S. Geological Survey Open-File Report 92-524, p. 285-295.

Areal and volumetric yields, historical extrapolation, deposit modeling, organic geochemical mass balance

Drew, L.J., 1966, Grid drilling exploration and its application to the search for petroleum: University Park, Pa., Pennsylvania State University, Ph.D. thesis, 141 p.

Historical extrapolation

Drew, L.J., 1967, Grid-drilling exploration and its application to the search for petroleum: Economic Geology, v. 62, no. 5, p. 698-710.

Historical extrapolation

Drew, L.J., 1972, Spatial distribution of the probability of occurrence and the value of petroleum--Kansas, an example: Journal of the International Association for Mathematical Geology, v. 4, no. 2, p. 155-171.

Areal and volumetric yields

Drew, L.J., 1974, Estimation of petroleum exploration success and the effects of resource base exhaustion via a simulation model: U.S. Geological Survey Bulletin 1328, 25 p.

Historical extrapolation

Drew, L.J., 1975a, Analysis of the rate of wildcat drilling and deposit discovery: Journal of the International Association for Mathematical Geology, v. 7, no. 5/6, p. 395-414.

Historical extrapolation

Drew, L.J., 1975b, Analysis of the rate of wildcat drilling and petroleum deposit recovery, *in* Davis, J.C., Doveton, J.H., and Harbaugh, J.W., convenors, Probability methods in oil exploration--American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1975, Notes: Lawrence, Kans., Kansas Geological Survey, p. 12-15.

Historical extrapolation

Drew, L.J., 1975c, Linkage effects between deposit discovery and post-discovery exploratory drilling: U.S. Geological Survey Journal of Research, v. 3, no. 2, p. 169-179.

Historical extrapolation

Drew, L.J., 1990, Oil and gas forecasting--Reflections of a petroleum geologist: New York, Oxford University Press, International Association for Mathematical Geology, Studies in Mathematical Geology, no. 2, 252 p.

Areal and volumetric yields, field-size distributions, historical extrapolation, quantitative characterization of undiscovered resources

Drew, L.J., 1993, The crisis over the 1988 National Oil and Gas Assessment for the United States: Nonrenewable Resources, v. 2, no. 1, p. 3-13.

General

Drew, L.J., Attanasi, E.D., and Root, D.H., 1977, Importance of physical parameters in petroleum supply models, *in* DeYoung, J.H., Jr., ed., Mineral policies in transition--The Mineral Economics Symposium, 3d, Washington, D.C., 1977, Proceedings: Washington, D.C., American Institute of Mining, Mettalurgical, and Petroleum Engineers, p. 52-69. [Also published in 1979, Materials and Society, v. 3, no. 2, p. 163-174.]

Historical extrapolation

Drew, L.J., Attanasi, E.D., and Schuenemeyer, J.H., 1988, Observed oil and gas field size distributions--A consequence of the discovery process and prices of oil and gas: Mathematical Geology, v. 20, no. 8, p. 939-953.

Field-size distributions, historical extrapolation

Drew, L.J., Grender, G.C., and Turner, R.M., 1983, Atlas of discovery rate profiles showing oil and gas discovery rates by geological province in the United States: U.S. Geological Survey Open-File Report 83-75, 269 p.

Historical extrapolation

Drew, L.J., and Lore, G.L., 1992, Field growth in the Gulf of Mexico--A progress report, *in* Carter, L.M.H., ed., USGS research on energy resources, 1992--Program and abstracts: U.S. Geological Survey Circular 1074, p. 22-23.

Reserve growth/confirmation

Drew, L.J., and Root, D.H., 1982, Statistical estimate of tomorrow's offshore oil and gas fields: Ocean Industry, v. 17, no. 5, p. 54-58, 66.

Historical extrapolation

Drew, L.J., Root, D.H., and Bawiec, W.J., 1979, Estimating future rates of petroleum discovery in the Permian Basin, *in* Hydrocarbon Economics and Evaluation Symposium, 8th, Dallas, Tex., 1979, Papers: Dallas, Tex., Society of Petroleum Engineers of AIME, SPE 7722, p. 101-106.

Field-size distributions, historical extrapolation

Drew, L.J., and Schuenemeyer, J.H., 1992, A petroleum discovery-rate forecast revisited--The problem of field growth: Nonrenewable Resources, v. 1, no. 1, p. 51-60.

Historical extrapolation, reserve growth/confirmation

Drew, L.J., and Schuenemeyer, J.H., 1993, The evolution and use of discovery process models at the U.S. Geological Survey: American Association of Petroleum Geologists Bulletin, v. 77, no. 3, p. 467-478.

Historical extrapolation

Drew, L.J., Schuenemeyer, J.H., and Attanasi, E.D., 1988, A rationale for the method of estimating the number of small undiscovered oil and gas fields, *in* Carter, L.M.H., ed., USGS research on energy resources, 1988--Program and abstracts: U.S. Geological Survey Circular 1025, p. 14.

Field-size distributions, historical extrapolation

Drew, L.J., Schuenemeyer, J.H., and Bawiec, W.J., 1979, Petroleum exhaustion maps of the Cretaceous "D-J" sandstone stratigraphic interval of the Denver basin: U.S. Geological Survey Miscellaneous Investigations Series Map I-1138, scale 1:200,000, 4 sheets, 7 p.

Field-size distributions, historical extrapolation

Drew, L.J., Schuenemeyer, J.H., and Bawiec, W.J., 1982, Estimation of the future rates of oil and gas discoveries in the western Gulf of Mexico: U.S. Geological Survey Professional Paper 1252, 26 p.

Field-size distributions, historical extrapolation

Drew, L.J., Schuenemeyer, J.H., Mast, R.F., and Dolton, G.L., 1987, Estimates of the ultimate number of oil and gas fields expected to be found in the Minnelusa play of the Powder River Basin: U.S. Geological Survey Open-File Report 87-443, 22 p.

Field-size distributions, historical extrapolation

Drew, L.J., Schuenemeyer, J.H., and Root, D.H., 1977, Statistical history of petroleum exploration in Denver Basin [abs.]: American Association of Petroleum Geologists Bulletin, v. 61, no. 5, p. 782.

Historical extrapolation

Drew, L.J., Schuenemeyer, J.H., and Root, D.H., 1978, The use of a discovery process model based on the concept of area of influence of a drill hole to predict discovery rates in the Denver Basin, *in* Pruit, J.D., and Coffin, P.E., eds., Energy resources of the Denver Basin: Denver, Colo., Rocky Mountain Association of Geologists, p. 31-34.

Historical extrapolation

Drew, L.J., Schuenemeyer, J.H., and Root, D.H., 1980, Petroleum-resource appraisal and discovery rate forecasting in partially explored regions--An application to the Denver Basin: U.S. Geological Survey Professional Paper 1138-A, p. A1-A11.

Field-size distributions, historical extrapolation

Drew, L.J., and Root, D.H., 1982, Statistical estimate of tomorrow's offshore oil and gas fields: Ocean Industry, v. 17, no. 5, p. 54-58, 66.

Historical extrapolation

Ducastaing, Michel, and Harbaugh, J.W., 1982, Forecasting future oil field sizes through statistical analysis of historical changes in oil field populations, *in* Gass, S.I., ed., Oil and gas supply modeling (Symposium, Washington, 1980, Proceedings): National Bureau of Standards Special Publication 631, p. 200-256.

Field-size distributions

Dvali, M.F., and Dmitrieva, T.P., 1976, Obyemno-statisticheskiy metod podscheta prognoznykh zapasov nefti i gaza [Volumetric-statistical method for calculating undiscovered oil and gas resources]: Leningrad, Nedra, v. 363, 112 p.

Areal and volumetric yields

Edgar, N,T., and Bayer, K.C., 1979, Accessing oil and gas resources on the U.S. continental margin: Oceanus, v. 22, no. 3, p. 12-22.

Areal and volumetric yields

Elliot, M.A., and Linden, H.R., 1968, A new analysis of U.S. natural gas supplies: Journal of Petroleum Technology, v. 20, Feb., p. 135-141.

Historical extrapolation

Energy, Mines and Resources Canada, 1977, Oil and natural gas resources of Canada, 1976: Ottawa, Energy, Mines and Resources Canada Report EP 77-1, 76 p.

Areal and volumetric yields, deposit modeling

Fisher, D.W., LeFever, J.A., Heck, T.J., and LeFever, R.D., 1991, Petroleum potential of the Little Missouri National Grasslands: North Dakota Geological Survey Report of Investigation 91, 52 p.

Historical extrapolation

Fitzpatrick, Arthur, Hitchon, Brian, and McGregor, J.R., 1973, Long-term growth of the oil industry in the United States: Journal of the International Association for Mathematical Geology, v. 5, no. 3, p. 237-267.

Historical extrapolation

Flawn, P.T., 1967, Concepts of resources--Their effects on exploration and United States mineral policy, *in* Exploration and economics of the petroleum industry, v. 5: Houston, Tex., Gulf Publishing Co., p. 5-24.

Areal and volumetric yields, historical extrapolation

Folinsbee, R.E., 1977, World's view--From Alph to Zipf: Geological Society of America Bulletin, v. 88, no. 7, p. 897-907.

Field-size distributions

Forman, D.J., 1988, Review *of* Oil and gas assessment--Methods and applications, ed. by D.D. Rice, 1986 (American Association of Petroleum Geologists Studies in Geology 21, 267 p.): Mathematical Geology, v. 20, no. 5, p. 611-613.

General

Forman, D.J., and Hinde, A.L., 1985, Improved statistical method for assessment of undiscovered petroleum resources: American Association of Petroleum Geologists Bulletin, v. 69, no. 1, p. 106-118.

Historical extrapolation

Forman, D.J., and Hinde, A.L., 1986, Examination of the creaming methods of assessment applied to the Gippsland basin, offshore Australia, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 101-110.

Historical extrapolation

Forman, D.J., and Hinde, A.L., 1990, Computer-assisted estimation of discovery and production of crude oil from undiscovered accumulations, *in* Ga‡l, Gabor, and Merriam, D.F., eds., Computer applications in resource estimation--Prediction and assessment for metals and petroleum: New York, Pergamon Press, Computers and Geology, v. 7, p. 253-271.

Historical extrapolation, deposit modeling

Forman, D.J., Hinde, A.L., Cadman, S.J., and Radlinski, A.P., 1993, Towards assessment of plays containing migrated petroleum, *in* Harff, J., and Merriam, D.F., eds., Computerized basin analysis: New York, Plenum Press, p. 275-299.

Historical extrapolation, deposit modeling

Forman, D.J., Hinde, A.L., and Radlinski, A.P., 1992, Assessment of undiscovered petroleum resources by the Bureau of Mineral Resources, Australia: Energy Sources, v. 14, p. 183-203.

Historical extrapolation, deposit modeling

Fuller, J.D., and Wang, F., 1993, A probabilistic model of petroleum discovery: Nonrenewable Resources, v. 2, no. 4, p. 325-330.

Historical extrapolation

Gangwar, Anshumali, Kent, H.C., Schuenemeyer, J.H., Guzman, Jaime, and Snow, Stuart, 1983, Econometric and resource modeling methodology for projections of cost of development of U.S. natural gas potential, *in* SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, Tex., 1983, Proceedings: Dallas, Tex., Society of Petroleum Engineers of AIME, SPE 11296, p. 69-81.

Historical extrapolation

Garland, T.M., Carrales, M., Jr., and Conway, J.S., 1974, Assessment of U.S. petroleum supply with varying drilling efforts: U.S. Bureau of Mines Information Circular 8634, 36 p.

Reserve growth/confirmation

Garrett, R.W., Jr., Marsh, G.R., Baker, R.A., Gehman, H.M., and White, D.A., 1974, Assessing regional oil and gas potential, *in* Crandall, K.H., and Harbaugh, J.W., convenors, Methods of estimating the volume of undiscovered oil and gas resources--American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1974 [Proceedings]: Stanford, Calif., Stanford University, p. 311-344.

Areal and volumetric yields, historical extrapolation, mathematical tools, reserve growth/confirmation

Gehman, H.M., Baker, R.A., and White, D.A., 1975, Prospect risk analysis, *in* Davis, J.C., Doveton, J.H., and Harbaugh, J.W., convenors, Probability methods in oil exploration--American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1975, Notes: Lawrence, Kans., Kansas Geological Survey, p. 16-20.

Deposit modeling

Gehman, H.M., Baker, R.A., and White, D.A., 1975, 1981, Assessment methodology--An industry viewpoint, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 113-121.

Deposit modeling

Gess, G., 1975, Methodology of hydrocarbon resource appraisal in relationship to the "petroleum zone" concept and probabilistic calculation, *in* Grenon, M., ed., First IIASA Conference on Energy Resources, May 1975 [Proceedings]: Laxenburg, Austria, International Institute for Applied Systems Analysis, p. 361-371.

General

Gess, G., and Bois, C., 1977, Study of petroleum zones--A contribution to the appraisal of hydrocarbon resources, *in* Meyer, R.F., ed., The future supply of nature-made petroleum and gas--UNITAR Conference on Energy and the Future, 1st, Laxenburg, Austria, 1976, Technical Reports: New York, Pergamon Press, p. 155-178.

Areal and volumetric yields

Gill, Dan, 1992, Israel's petroleum discovery curve: Nonrenewable Resources, v. 1, no. 3, p. 231-238.

Historical extrapolation

Gill, D., and Gabai, R., 1983, Oil prospects of the Helez Formation, southern Hashephela region, Israel--Evaluation of the thoroughness of search achieved by past exploration: Journal of the International Association for Mathematical Geology, v. 15, no. 1, p. 211-215.

Historical extrapolation

Gill, D., and Griffiths, J.C., 1984, Areal value assessment of the mineral resources endowment of Israel: Journal of the International Association for Mathematical Geology, v. 16, no. 1, p. 37-89.

Areal and volumetric yields

Gillette, Robert, 1974, Oil and gas resources--Did U.S.G.S. gush too high?: Science, v. 185, no. 4146, p. 127-130.

Areal and volumetric yields, historical extrapolation, deposit modeling

Goff, J.C., 1983, Hydrocarbon generation and migration from Jurassic source rocks in the East Shetland basin and Viking Graben of the northern North Sea: Journal of the Geological Society of London, v. 140, pt. 3, p. 445-474. [Reprinted in Demaison, Gerard, and Murris, R.J., eds., 1984, Petroleum geochemistry and basin evaluation: American Association of Petroleum Geologists Memoir 35, p. 139-158.]

Organic geochemical mass balance

Golovin, Lewis, 1970, Two mathematical models for oil and gas disposition: Cambridge, Mass., Massachusetts Institute of Technology, Sloan School of Management, M.S. thesis, 65 p.

Historical extrapolation

Gotautas, V.A., 1963, Quantitative analysis of prospect to determine whether it is drillable: American Association of Petroleum Geologists Bulletin, v. 47, no. 10, p. 1794-1812.

Deposit modeling

Grace, J.D., 1988, Advantages and limitations of discovery process modeling--The case of the northern West Siberia gas plays, *in* Chung, C.F., Fabbri, A.G., and Sinding-Larsen, R., eds., Quantitative analysis of mineral and energy resources: Dordrecht, Holland, D. Reidel Publishing, NATO ASI Series C, Mathematical and Physical Sciences, v. 223, p. 651-668.

Historical extrapolation

Grender, G.C., Rapoport, L.A., and Vinkovetsky, Y., 1978, Analysis of oil-field distribution for sedimentary basins of United States [abs.]: American Association of Petroleum Geologists Bulletin, v. 62, no. 3, p. 518.

Field-size distributions

Grenon, M., 1975, Methods for assessing petroleum resources, [introduction to] chap. 2, *in* Grenon, M., ed., IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings, p. 129-181. [Reprinted in Grenon, Michel, ed., 1979, Methods and models for assessing energy resources,IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 115-116.]

Areal and volumetric yields, field-size distributions, historical extrapolation, deposit modeling

Griffiths, J.C., 1962a, Frequency distribution of some natural resource materials, *in* Technical Conference on Petroleum Production, 23d, University Park, Pa., 1962: Pennsylvania State University, Mineral Industries Experiment Station Circular 63, p. 173-198.

Historical extrapolation

Griffiths, J.C., 1962b, Uses of computers and statistics in exploration and development of mineral resources, *in* Computer Short Course and Symposium on Mathematical Techniques and Computer Applications in Mining and Exploration, Tucson, Ariz., 1962: Tucson, Ariz., University of Arizona, v. 1, p. E1-1 to E1-19.

Historical extrapolation

Griffiths, J.C., 1966, Exploration for natural resources: Operations Research, v. 14, no. 2, p. 189-209.

Historical extrapolation

Griffiths, J.C., 1967, Mathematical exploration strategy and decision-making: World Petroleum Congress, 7th, Mexico, 1967, Proceedings: Amsterdam, Elsevier, v. 2, p. 599-604.

Historical extrapolation

Griffiths, J.C., and Drew, L.J., 1964, Simulation of exploration programs for natural resources by models: Quarterly of the Colorado School of Mines, v. 59, no. 4, pt. A, p. 187-206.

Historical extrapolation

Griffiths, J.C., and Drew, L.J., 1966, Grid spacing and success ratios in exploration for natural resources, *in* International Symposium on Computers and Operations Research, 6th, Pennsylvania State University, 1966, Proceedings: Pennsylvania State University, Mineral Industries Experiment Station Special Publication 2-65, v. 1, p. Q-1 to Q-24.

Historical extrapolation

Griffiths, J.C., Menzie, D.W., and Labovitz, M.L., 1975, Exploration for and evaluation of natural resources, *in* Davis, J.C., Doveton, J.H., and Harbaugh, J.W., convenors, Probability methods in oil exploration--American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1975, Notes: Lawrence, Kans., Kansas Geological Survey, p. 21-25.

Historical extrapolation

Griggs, D.G., and Jaske, R.J., 1975, Preliminary U.S.G.S. oil and gas resource estimate for Federal OCS lease sale #35 off southern California, *in* Davis, J.C., Doveton, J.H., and Harbaugh, J.W., convenors, Probability methods in oil exploration--American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1975, Notes: Lawrence, Kans., Kansas Geological Survey, p. 26-31.

Deposit modeling

Grossling, B.F., 1975, In search of a statistical probabliity model for petroleum-resource assessment: U.S. Geological Survey Circular 724, 18 p.

Historical extrapolation

Grossling, B.F., 1976, Window on oil--A survey of world petroleum sources: London, The Financial Times, 140 p.

Areal and volumetric yields

Grossling, B.F., 1977, A critical survey of world petroleum opportunities, chap. 20 *of* Congressional Research Service, Project Interdependence--U.S. and world energy outlook through 1990: U.S. Congress, 95th, 1st Session, Committee Print 95-33, p. 645-658.

Areal and volumetric yields, historical extrapolation

Halbouty, M.T., Meyerhoff, A.A., King, R.E., Dott, R.H., Sr., Klemme, H.D., and Shabad, Theodore, 1970, World's giant oil and gas fields, geologic factors affecting their formation, and basin classification, *in* Halbouty, M.T., ed., Geology of giant petroleum fields: American Association of Petroleum Geologists Memoir 14, p. 502-555.

Areal and volumetric yields

Halbouty, M.T., and Moody, J.D., 1980, World ultimate reserves of crude oil, *in* World Petroleum Congress, 10th, Bucharest, 1979, Proceedings: London, Heyden, v. 2, p. 291-301.

Areal and volumetric yields, deposit modeling

Halfman, S.E., 1984, Normalizing exploration functions for Powder River, Denver, and Midland Basins [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 483.

Historical extrapolation

Hall, C.A.S., and Cleveland, C.J., 1981, Petroleum drilling and production in the United States--Yield per effort and net energy analysis: Science, v. 211, no. 4482, p. 576-679.

Historical extrapolation

Harbaugh, J.W., 1984, Quantitative estimation of petroleum prospect outcome probabilities--An overview of procedures: Marine and Petroleum Geology, v. 1, no. 4, p. 298-312.

Field-size distributions, historical extrapolation, deposit modeling, quantitative characterization of undiscovered resources

Harbaugh, J.W., Doveton, J.H., and Davis, J.C., 1977, Probability methods in oil exploration: New York, John Wiley & Sons, 269 p.

Areal and volumetric yields, field-size distributions, historical extrapolation

Harbaugh, J.W., and Ducastaing, Michel, 1981, Historical changes in oil-field populations as a method of forecasting field sizes of undiscovered populations--A comparison of Kansas, Wyoming, and California: Kansas Geological Survey, Subsurface Geology Series 5, 56 p.

Field-size distributions

Harff, J.E., Davis, J.C., and Eiserbeck, W., 1993, Prediction of hydrocarbons in sedimentary basins: Mathematical Geology, v. 25, no. 7, p. 925-936.

Historical extrapolation

Harff, J., Davis, J.C., and Olea, R.A., 1992, Quantitative assessment of mineral resources with an application to petroleum geology: Nonrenewable Resources, v. 1, no. 1, p. 74-84.

Historical extrapolation

Harris, D.P., 1977, Quantitative methods for the appraisal of mineral resources: U.S. Department of Energy Report GJBX-14(77), 849 p. Available from U.S. Geological Survey, Map Distribution, Box 25286, MS 306, Federal Center, Denver, CO 80225.

Areal and volumetric yields, historical extrapolation

Harris, DeVerle, Miao, Y.H., Pan, Guocheng, and Wilson, Tetevi, 1992, Estimation of the potential supply of U.S. oil by life cycle and learning models: Nonrenewable Resources, v. 1, no. 3, p. 239-252.

Historical extrapolation, quantitative characterization of undiscovered resources

Harris, D.P., and Wilson, Tetevi, 1992, Econometric and learning curve estimation of U.S. potential oil supply: Nonrenewable Resources, v. 1, no. 4, p. 323-347.

Historical extrapolation

Haun, J.D., 1975a, Methods of estimating the volume of undiscovered oil and gas resources--AAPG research conference, *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 1-7.

Areal and volumetric yields, historical extrapolation

Haun, J.D., 1975b, What are ways of estimating unlocated oil, gas volumes?: Oil and Gas Journal, v. 73, no. 29, p. 94-96.

Areal and volumetric yields, historical extrapolation

Hedberg, H.D., 1975a, False precision in petroleum resource estimates, *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 160.

Mathematical tools

Hedberg, H.D., 1975b, The volume-of-sediment fallacy in estimating petroleum resources, *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 161.

Areal and volumetric yields

Hendricks, T.A., 1965, Resources of oil, gas, and natural gas liquids in the United States and the world: U.S. Geological Survey Circular 522, 20 p.

Areal and volumetric yields

Hendricks, T.A., 1974, Estimating resources of crude oil and natural gas in inadequately explored areas *in* Crandall, K.H., and Harbaugh, J.W., convenors, Methods of estimating the volume of undiscovered oil and gas resources--American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1974 [Proceedings]: Stanford, Calif., Stanford University, p. 47-57. [Reprinted *in* Haun, J.D., ed., 1975, Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 19-22.]

Areal and volumetric yields

Herbert, J.H., 1982, A review and comparison of some commonly used methods of estimating petroleum resource availability: Energy Sources, v. 6, no. 4, p. 293-320.

Areal and volumetric yields, historical extrapolation

Herbert, J.H., 1983, A concise mathematical statement of the relationship between the Arps/Roberts and Barouch/Kaufmann models for estimating the petroleum resource base: Energy Sources, v. 7, no. 1, p. 33-42.

Historical extrapolation

Hill, G.W., 1982, Resource-estimation models and predicted discovery, *in* de Marsily, Ghislain, and Merriam, D.F., eds., Predictive geology, with emphasis on nuclear waste disposal: New York, Pergamon Press, Computers and Geology, v. 4, p. 191-204.

Historical extrapolation, reserve growth/confirmation

Hopkins, G.R., 1950, A projection of oil discovery 1949-1965: Journal of Petroleum Technology, June 1950, sec. 1, p. 6-9, sec. 2, p. 6.

Historical extrapolation

Houghton, J.C., 1986, Use of field size distributions in analog basins for hydrocarbon resource assessment: U.S. Geological Survey Open-File Report 86-180, 40 p.

Field-size distributions

Houghton, J.C., 1988, Use of the truncated shifted Pareto distribution in assessing size distribution of oil and gas fields: Mathematical Geology, v. 20, no. 8, p. 907-937.

Field-size distributions

Houghton, J.C., Dolton, G.L., Mast, R.F., Masters, C.D., and Root, D.H., 1993, U.S. Geological Survey estimation procedure for accumulation size distributions by play: American Association of Petroleum Geologists Bulletin, v. 77, no. 3, p. 454-466.

Field-size distributions, direct expert assessment, mathematical tools

Houghton, J.C., and Drew, L.J., 1984, Estimation of oil and gas resources in frontier basins from field-size distributions in analogous explored basins [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 487.

Field-size distributions

Houpeurt, A.H., Groult, J., Mollier, M., Salle, C.L., Simandoux, P.R., and Thomere, R., 1975, Principe et methodes de calcul des reserves d'huile et de gaz [Principles and methods of calculating reserves of oil and gas], *in* World Petroleum Congress, 9th, Tokyo, 1975, Proceedings: London, Applied Science Publishers, v. 3, p. 21-30.

Areal and volumetric yields, historical extrapolation, organic geochemical mass balance

Howarth, R.J., White, C.M., and Koch, G.S., Jr., 1980, On Zipf's Law applied to resource prediction: Institution of Mining and Mettalurgy, Transactions, sec. B, Applied Earth Science, v. 89, p. B182-190.

Field-size distributions

Hubbert, M.K., 1959, Techniques of prediction with application to the petroleum industry: Houston, Texas, Shell Development Co. Publication Preprint no. 204, 42 p.

Historical extrapolation

Hubbert, M.K., 1962, Energy resources--A report to the Committee on Natural Resources of the National Academy of Sciences—National Research Council: Washington, D.C., National Academy of Sciences—National Research Council Publication 1000-D, 141 p. [Reprint (1973) available from National Technical Information Service, Springfield, VA 22161 as report PB-222 401].

Historical extrapolation

Hubbert, M.K., 1965, National Academy of Sciences report on energy resources--Reply: American Association of Petroleum Geologists Bulletin, v. 49, no. 10, p. 1720-1727.

Historical extrapolation

Hubbert, M.K., 1966a, History of petroleum geology and its bearing upon present and future exploration: American Association of Petroleum Geologists Bulletin, v. 50, no. 12, p. 2504-2518.

Historical extrapolation

Hubbert, M.K., 1966b, M. King Hubbert's reply to J.M. Ryan: Journal of Petrloeum Technology, v. 18, no. 3, p. 284-286.

Historical extrapolation

Hubbert, M.K., 1967, Degree of advancement of petroleum exploration in United States: American Association of Petroleum Geologists Bulletin, v. 51, no. 11, p. 2207-2227.

Areal and volumetric yields, historical extrapolation

Hubbert, M.K., 1969, Energy resources, chap. 8 *of* National Research Council, Committee on Resources and Man, Resources and man--A study and recommendations: San Francisco, W.H. Freeman, p. 157-242.

Historical extrapolation

Hubbert, M.K., 1972, Estimation of oil and gas resources, *in* Workshop on Techniques of Mineral Resource Appraisal, Denver, 1972, Proceedings: U.S. Geological Survey, p. 16-50.

Historical extrapolation

Hubbert, M.K., 1973, Survey of world energy resources: Canadian Mining and Metallurgical Bulletin, v. 66, no. 735, p. 37-53.

Areal and volumetric yields, historical extrapolation

Hubbert, M.K., 1974, U.S. energy resources, a review as of 1972, *in* U.S. Senate Committee on Interior and Insular Affairs, U.S. energy resources, a review as of 1972, a background paper: U.S. Congress, 93d, 2d session, Committee Print, serial no. 93-40 (92-74), pt. 1, p. 1-201.

Areal and volumetric yields, historical extrapolation

Hubbert, M.K., 1975, Ratio between recoverable oil per unit volume of sediments for future exploratory drilling to that of the past for the conterminous United States, *in* Report of Panel on Estimation of Mineral Reserves and Resources, appendix to sec. II *of* Mineral resources and the environment: Washington, D.C., National Academy of Sciences, p. 1-9. [p. 13-23]. Appendix published separately.

Areal and volumetric yields, historical extrapolation

Hubbert, M.K., 1979, Hubbert estimates from 1956 to 1974 of US oil and gas, *in* Grenon, Michel, ed., 1979, Methods and models for assessing energy resources--IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 370-383.

Historical extrapolation

Hubbert, M.K., 1982, Techniques of prediction as applied to the production of oil and gas, *in* Gass, S.I., ed., Oil and gas supply modeling (Symposium, Washington, 1980, Proceedings): National Bureau of Standards Special Publication 631, p. 16-141.

Areal and volumetric yields, historical extrapolation

Hunt, J.M., 1962, Distribution of hydrocarbons in sedimentary rocks: Geochemica et Cosmochemica Acta, v. 22, no. 1, p. 37-49.

Areal and volumetric yields

Ikoku, C.U., 1980, Decision analysis--How to make risk evaluations: World Oil, v. 191, no. 4, p. 71-74, 81; no. 5, p. 157, 158, 160, 162.

Deposit modeling

Ivanhoe, L.F., 1976, Evaluating prospective basins: Oil and Gas Journal, v. 74, no. 49, p. 154-155; no. 50, p. 108-110; no. 51, p. 82-84.

Field-size distributions

Ivanhoe, L.F., 1986a, Limitations of geological consensus estimates of undiscovered petroleum resources, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 77-83.

Direct expert assessment

Ivanhoe, L.F., 1986b, Oil discovery index rates and projected discoveries of the free world, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 159-178.

Historical extrapolation

Ivanova, M.M., Gutman, I.S., and Cholovsky, I.P., 1984, Puti sovershenstvovaniya klassifikatsii perspektivnykh i prognoznykh resursov nefti, goryuchego gaza i kondensata i metodicheskiye voprosy ikh otsenki [Improvement of the classification of prospective and prognosticated resources of oil, flammable gas, and condensate and methodological problems of their assessment], *in* Bakirov, A.A., and Marasanova, N.V., eds., Problemy kolichestvennogo prognozirovaniya neftegazonosnosti nedr [Problems of the quantitative prediction of amounts of oil and gas in subsurface]: Moscow, Nauka, p. 65-70.

Deposit modeling

Jasko, T., 1990, Petroleum prospect size estimation by numerical methods, *in* Ga‡l, Gabor, and Merriam, D.F., eds., Computer applications in resource estimation--Prediction and assessment for metals and petroleum: New York, Pergamon Press, Computers and Geology, v. 7, p. 339-346.

Deposit modeling, mathematical tools

Jeffries, F.S., 1975, Australian oil exploration--A great lottery: The APEA Journal, v. 15, pt. 2, p. 48-51.

Areal and volumetric yields, field-size distributions, historical extrapolation

Johnson, C.J., and Dorian, J.P., 1984, Application of resource assessment data to policy decisions in developing countries, *in* Masters, C.D., ed., Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, p. 146-157.

General

Johnson, R.C., Crovelli, R.A., Spencer, C.W., and Mast, R.F., 1987, An assessment of gas resources in low-permeability sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado: U.S. Geological Survey Open-File Report 87-357, 165 p.

Deposit modeling

Johnson, R.C., Crovelli, R.A., Spencer, C.W., and Mast, R.F., 1988, An assessment of gas resources in low-permeability sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado, *in* Carter, L.M.H., ed., USGS research on energy resources, 1988--program and abstracts: U.S. Geological Survey Circular 1025, p. 23-24.

Deposit modeling

Jones, D.A., Buck, N.A., and Kelsey, J.H., 1982, Choosing an optimum exploration strategy: World Oil, v. 195, no. 4, p. 71-86.

Historical extrapolation

Jones, R.W., 1975, A quantitative geologic approach to prediction of petroleum resources, *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 186-195.

Areal and volumetric yields

Kalinin, N.A., 1979, Metodika dolgosrochnogo prognozirovaniya razvedki i dobychi nefti [Methods of the long-term forecasting in oil exploration and recovery]: Nauchno-Issledovatel'skiy Institut Geologii Zarubezhnykh Stran, Trudy, v. 36, 143 p.

Historical extrapolation

Kalinin, N.A., ed., 1986, Tipovyye modeli dolgosrochnogo prognozirovaniya dinamiki razvedki i dobychi nefti i gaza [Type models for long-term forecasting of oil and gas exploration and production dynamics]: Nauchno-Issledovatel'skiy Institut Geologii Zarubezhnykh Stran, Trudy, v. 44, 336 p.

Historical extrapolation, mathematical tools

Kaufman, G.M., 1963, Statistical decision and related techniques in oil and gas exploration: New York, Prentice Hall, 307 p.

Field-size distributions, historical extrapolation, reserve growth/confirmation

Kaufman, G.M., 1965, Statistical analysis of the size distribution of oil and gas fields, *in* Symposium on Petroleum Economics and Evaluation, 3rd, Dallas, Tex., 1965: Dallas, Tex., Society of Petroleum Engineers of AIME, p. 109-124.

Field-size distributions

Kaufman, G.M., 1974, Statistical methods for predicting the number and size distribution of undiscovered hydrocarbon deposits, *in* Crandall, K.H., and Harbaugh, J.W., convenors, Methods of estimating the volume of undiscovered oil and gas resources--American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1974 [Proceedings]: Stanford, Calif., Stanford University, p. 247-310.

Field-size distributions, historical extrapolation

Kaufman, G.M., 1975, Models and methods for estimating undiscovered oil and gas--What they do and do not do, *in* Grenon, M., ed., First IIASA Conference on Energy Resources, May 1975 [Proceedings]: Laxenburg, Austria, International Institute for Applied Systems Analysis, p. 237-249. [Reprinted in Grenon, Michel, ed., 1979, Methods and models for assessing energy resources--IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 173-185.]

Areal and volumetric yields, historical extrapolation, direct expert assessment, reserve growth/confirmation

Kaufman, G.M., 1982, Issues past and present in modelling oil and gas supply, *in* Gass, S.I., ed., Oil and gas supply modeling (Symposium, , Washington, 1980, Proceedings): National Bureau of Standards Special Publication 631, p. 257-271.

Historical extrapolation, deposit modeling, direct expert assessment

Kaufman, G.M., 1986, Finite population sampling methods for oil and gas resource estimation, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 43-53.

Historical extrapolation

Kaufman, Gordon, Balcer, Y., and Kruyt, D., 1974, A probabilistic model of the oil and gas discovery process, *in* Benenson, Peter, Ruderman, Henry, Merrill, Deane, and Sathaye, Jayant, eds., Conference on Energy Modeling and Forecasting, Berkeley, Calif., 1974, Proceedings: Berkeley, Calif., University of California, Lawrence Berkeley Laboratory, p. 13-26. Available from National Technical Information Service, Springfield, VA 22161 as report LBL 3635.

Field-size distributions, historical extrapolation

Kaufman, Gordon, Balcer, Y., and Kruyt, D., 1975, A probabilistic model of oil and gas discovery, *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 113-142.

Field-size distributions, historical extrapolation

Kaufman, Gordon, and Bradley, P.G., 1973, Two stochastic models useful in petroleum exploration, *in* Pitcher, M.G., ed., Arctic geology: American Association of Petroleum Geologists Memoir 19, p. 633-637.

Historical extrapolation

Kaufman, G.M., Crovelli, R.A., Chow, S., Grace, J.D., Sinding-Larsen, R., Sollie, B.H., and Wang, P.C.C., 1988, Oil and gas resource modeling and forecasting, *in* Chung, C.F., Fabbri, A.G., and Sinding-Larsen, R., eds., Quantitative analysis of mineral and energy resources: Dordrecht, Holland, D. Reidel Publishing, NATO ASI Series C, Mathematical and Physical Sciences, v. 223, p. 695-700.

General

Kaufman, G.M., and Lee, P.J., 1992, Are wildcat well outcomes dependent or independent?: Nonrenewable resources, v. 1, no. 3, p. 201-213.

Historical extrapolation

Kaufman, G.M., Runggaldier, W., and Livne, Z., 1981, Predicting the time rate of supply from a petroleum play, *in* Ramsey, J.B., ed., The economics of exploration for energy resources: Greenwich, Conn., Jai Press, p. 69-102.

Historical extrapolation

Kent, H.C., and Herrington, J.C., 1986, Estimation of potential gas resources--Methodology of the potential gas committee, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 143-149.

Areal and volumetric yields

Khalimov, E.M., 1990, Predvaritelno otsenennye zapasy—Osnovnoy istochnik popolneniya syryevoy bazy dobychi nefti v novykh usloviyakh khozaystvovaniya [Preliminary estimated reserves—The main source for increase of the reserve base for oil production in new economic conditions], *in* Khalimov, E.M., Azamatov, V.I., and Baturin, Yu.N., eds., Resursy nefti i gaza i effectivnoye ikh osvoeniye [Oil and gas resources and efficiency of their development]: Moscow, Institut Geologii i Razrabotki Goryuchikh Iskopaeniykh, p. 3-17.

Reserve growth/confirmation

Khalimov, E.M., 1991, Kriterii dostovernosti zapasov nefti [Criteria of certainty of oil reserves]: Geologiya Nefti i Gaza, 1991, no. 4, p. 30-33.

Reserve growth/confirmation

Kingston, G.A., David, M., Meyer, R.F., Ovenshine, A.T., Slamet, S., and Schanz, J.J., 1978, Workshop on volumetric estimation: Journal of the International Association for Mathematical Geology, v. 10, no. 5, p. 495-499.

Areal and volumetric yields

Klemme, H.D., 1971, The giants and the supergiants: Oil and Gas Journal, v. 69, no. 9, p. 85-90; no. 10, p. 103-110; no. 11, p. 96-100.

Field-size distributions

Klemme, H.D., 1975a, Geothermal gradients, heat flow, and hydrocarbon recovery, *in* Fischer, A.G., and Judson, Sheldon, eds., Petroleum and global tectonics: Princeton University Press, p. 251-304.

Areal and volumetric yields

Klemme, H.D., 1975b, Giant oil fields related to their geologic setting--A possible guide to exploration: Bulletin of Canadian Petroleum Geology, v. 23, no. 1, p. 30-66.

Areal and volumetric yields, field-size distributions

Klemme, H.D., 1977, World oil and gas reserves from analysis of giant fields and petroleum basins (provinces), *in* Meyer, R.F., ed., The future supply of nature-made petroleum and gas--UNITAR Conference on Energy and the Future, 1st, Laxenburg, Austria, 1976, Technical Reports: New York, Pergamon Press, p. 217-260.

Areal and volumetric yields

Klemme, H.D., 1980, Petroleum basins--Classifications and characteristics: Journal of Petroleum Geology, v. 3, no. 2, p. 187-207.

Areal and volumetric yields

Klemme, H.D., 1983, Field size distribution related to basin characteristics: Oil and Gas Journal, v. 81, no. 52, p. 168-176.

Field-size distributions

Klemme, H.D., 1984, Field-size distribution related to basin characteristics, *in* Masters, C.D., ed., Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, p. 95-121.

Field-size distributions

Klemme, H.D., 1986, Field size distribution related to basin characteristics, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 85-99.

Field-size distributions

Knoring, L.D., 1986, O prognozirovanii dinamiki prirosta zapasov nefti i gaza [Forecast of the dynamics of increase of oil and gas reserves]: Geologiya Nefti i Gaza, 1986, no. 12, p. 10-15.

Historical extrapolation

Kontorovich, A.E., 1950, Teoreticheskie osnovy obemno-geneticheskogo metoda otsenki potentsialnykh resursov nefti i gaza [Theoretical basis for the volume-genetic method of estimating potential resources of oil and gas]: Novosibirsk, Russia, Trudy Sibirskogo Nauchno-Issledovatel'skogo Institut Geologii, Geofiziki i Mineral'nogo Syr'ia, no. 95, 51 p.

Organic geochemical mass balance

Kontorovich, A.E., 1970, Teoreticheskiye osnovy obyemno-geneticheskogo metoda otsenki potentsialnykh resursov nefti i gaza [Theoretical foundation of the volume-genetic method for assessment of potential oil and gas resources], *in* Materialy po geokhimii neftegazonosnykh basseynov Sibiri [Materials on geochemistry of oil- and gas-bearing basins of Siberia: Novosibirsk, Russia, p. 4-51.

Organic-geochemical mass balance

Kontorovich, A.E., 1976, Geokhimicheskie metody kolichestvennogo prognoza neftegazonosnosti [Geochemical methods for the quantitative evaluation of petroleum potential]: Moscow, Sibirskii Nauchno-issledovatel'skii Institut Geologii, Geofiziki i Mineral'nogo Syr'ia, Trudy, v. 229, 249 p.

Organic geochemical mass balance

Kontorovich, A.E., 1984, Geochemical methods for the quantitative evaluation of the petroleum potential of sedimentary basins, *in* Demaison, Gerard, and Murris, R.J., eds., Petroleum geochemistry and basin evaluation: American Association of Petroleum Geologists Memoir 35, p. 79-109.

Organic geochemical mass balance

Kontorovich, A.E., ed., 1988, Kolichestvennaya otsenka perspektiv neftegazonosnosti slaboizuchennykh regionov [Quantitative assessment of oil and gas potential in poorly known regions]: Moscow, Nedra, 224 p.

Areal and volumetric yields, field-size distributions, historical extrapolation, mathematical tools, quantitative characterization of undiscovered resources

Kontorovich, A.E., and Demin, V.I., 1977 [1979], Metod otsenki kolichestva i raspredeleniya po zapasam mestorozhdeniy nefti i gaza v krupnykh neftegazonosnykh basseynakh [A method of assessing the amount and distribution of oil and gas reserves in large oil and gas basins]: International Geology Review, v. 21, p. 361-367.

Field-size distributions

Kontorovich, A.E., Demin, V.I., and Livshits, V.P., 1989, Matematicheskoye modelirovaniye i vychislitelnyi eksperiment kak metod prognoza struktury nachalnykh geologicheskikh resursov nefti i gaza [Mathematical modeling and computational experiment as a method for prediction of the structure of original geologic resources of oil and gas], *in* Trofimuk, A.A., ed., Otsenka prognoznykh resursov nefti v svete ucheniya akademika I.M. Gubkina [Assessment of undiscovered oil resources in light of the theories of academician I.M. Gubkin]: Novosibirsk, Russia, Nauka, p. 10-41.

Field-size distributions, mathematical tools

Kontorovich, A.E., Fotiadi, E.E., Demin, V.I., and others, 1981, Prognoz mestorozhdeniy nefti i gaza [Forecast of oil and gas fields]: Moscow, Nedra, 350 p.

Areal and volumetric yields, field-size distributions, organic-geochemical mass balance, mathematical tools, quantitative characterization of undiscovered resources

Kontorovich, A.E., and Kirienko, G.I., 1987, Lokalno-statisticheskiy metod otsenki nachalnykh geologicheskikh i prognoznykh resursov nefti i gaza [Localized statistical method for assessment of original geologic and undiscovered resources of oil and gas]: Geologiya Nefti i Gaza, 1987, no. 3, p. 1-6.

Deposit modeling

Kontorovich, A.E., and Livshits, B.P., 1988, Imitatsionnoye matematicheskoye modelirovaniye stokhasticheskikh protsessov kak instrument koliches'tvennoy otsenki perspektiv neftegazonosnosti [Imitational mathematical modeling of stochastic processes as a tool for quantitative assessment of petroleum potential]: Geologiya Nefti i Gaza, 1988, no. 12, p. 48-51.

Field-size distributions, mathematical tools

Korotkov, S.T., 1959, Method of planning exploration in the Azov-Kuban oil-gas basin: Petroleum Geology, v. 3, no. 9A, p. 526-528.

Deposit modeling

Krylov, N.A., 1984, O problemakh ispolzovaniya geneticheskikh metodov otsenki prognoznykh resursov uglevodorodov [Problems in application of genetic methods for assessment of undiscovered hydrocarbon resources], *in* Bakirov, A.A., and Marasanova, N.V., eds., Problemy kolichestvennogo prognozirovaniya neftegazonosnosti nedr [Problems in quantitative prediction of amounts of oil and gas in the subsurface]: Moscow, Nauka, p. 71-78.

Organic-geochemical mass balance

Krylov, N.A., Baturin, Yu.N., and Ryzhik, V.M., 1986, Issledovaniye dinamiki obespechennosti zapasami dobychi nefti [Study of the dynamics of securing of oil production by reserves]: Geologiya Nefti i Gaza, 1986, no. 12, p. 1-6.

Historical extrapolation

Kudryashova, N.M., and Starik-Bludov, V.S., 1940, Obyemno-geneticheskiy metod podscheta zapasov nefti [Volume-genetic method of oil resource assessment]: Razvedka Nedr, no. 4

Organic-geochemical mass balance

Kunin, N. Ya., and Krasil'nikova, T.B., 1980, A statistical method of forecasting the number and size of petroleum-bearing anticline structures in platform regions: International Geology Review, v. 23, no. 12, p. 1443-1448.

Field-size distributions

Lacour, J.J., 1985, Oil reserves--What is really discovered?: Energy Exploration & Exploitation, v. 3, no. 2, p. 95-105.

Historical extrapolation, reserve growth/confirmation

Lador, Marc, 1981, Historical oil discovery trend in Libya, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 231-243.

Historical extrapolation

Landes, K.K., 1973, The estimation of undiscovered natural gas supplies, *in* National Gas Survey: Washington, D.C., U.S. Federal Power Commission, v. 5, p. 237-256.

Areal and volumetric yields, historical extrapolation

Lapointe, P.R., and Bielak, J.W., 1988, Hydrocarbon resource assessment through fractal geometry: Geological Society of America Abstracts with Programs, v. 20, no. 7, p. A403.

Historical extrapolation

Law, B.E., Spencer, C.W., Charpentier, R.R., Crovelli, R.A., Mast, R.F., Dolton, G.L., and Wandrey, C.J., 1989, Estimates of gas resources in overpressured low-permeability Cretaceous and Tertiary sandstone reservoirs, Greater Green River Basin, Wyoming, Colorado, and Utah, *in* Eisert, J.L., ed., Gas resources of Wyoming: Wyoming Geological Association Field Conference, 40th, Casper, Wyo., 1989, Guidebook, p. 39-62.

Deposit modeling

Law, B.E., Spencer, C.W., Crovelli, R.A., Mast, R.F., Dolton, G.L., Charpentier, R.R., and Wandrey, C.J., 1988, Assessment of gas contained in overpressured low-permeability reservoirs in the Greater Green River Basin of Wyoming, Colorado, and Utah, *in* Carter, L.M.H., ed., USGS research on energy resources, 1988--program and abstracts: U.S. Geological Survey Circular 1025, p. 27-28.

Deposit modeling

Lee, P.J., 1984, Estimation of oil potential of Beaverhill Lake Group, Alberta [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 499.

Field-size distributions

Lee, P.J., 1993, Oil and gas pool size probability distributions--J-shaped, lognormal, or Pareto?, *in* Current research, part E: Geological Survey of Canada, Paper 93-1E, p. 93-96.

Field-size distributions

Lee, P.J., Eggen, S.S., and Vann, I.R., 1989, Use of a probabalistic approach in assessing petroleum resources of the northern North Sea, appendix 13 *of* Sixth meeting of the Working Group on Resource Assessment, Bangkok, Thailand, September, 1989 [Proceedings]: Bangkok, [United Nations] Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP), CCOP Technical Secretariat, 21 p.

Field-size distributions, historical extrapolation

Lee, P.J., and Wang, P.C.C., 1983a, Conditional analysis for petroleum resource evaluation: Journal of the International Association for Mathematical Geology, v. 15, no. 2, p. 349-361.

Field-size distributions, deposit modeling

Lee, P.J., and Wang, P.C.C., 1983b, Probabilistic formulation of a method for the evaluation of petroleum resources: Journal of the International Association for Mathematical Geology, v. 15, no. 1, p. 163-181.

Field-size distributions, deposit modeling

Lee, P.J., and Wang, 1984, PRIMES--A petroleum resources information management and evaluation system: Oil and Gas Journal, v. 82, no. 40, p. 204-206.

Field-size distributions, historical extrapolation

Lee, P.J., and Wang, 1985, Prediction of oil or gas pool sizes when discovery record is available: Journal of the International Association for Mathematical Geology, v. 17, no. 2, p. 95-113.

Field-size distributions, historical extrapolation

Lee, P.J., and Wang, 1986, Evaluation of petroleum resources from pool size distributions, *in* Rice, ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 33-42.

Field-size distributions, historical extrapolation

Levorsen, A.I., 1950, Estimates of undiscovered petroleum reserves: United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, N.Y., 1949, Proceedings, v. 1, Plenary meetings, p. 94-99.

Areal and volumetric yields

Lewis, C.J., 1984, Are our oil and gas resource assessments realistic? [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 500.

General

Lewis, C.J., 1986, Are our oil and gas resource assessments realistic?, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 195-202.

Historical extrapolation, reserve growth/confirmation

Lin, Jie, and Wang, Jie, 1982, Geologic model for basin study: Shengli Oil Field, China, Geologic Research Institute of Shengli Oil Field, 21 p.

Organic geochemical mass balance

Lovejoy, W.F., and Homan, P.T., 1965, Methods of estimating reserves of crude oil, natural gas, and natural gas liquids: Washington, D.C., Resources for the Future; distributed by Johns Hopkins Press, Baltimore, Md., 163 p.

Historical extrapolation

Lucki, Zbigniew, and Szkutnik, Zbigniew, 1989, Petroleum exploration models--Estimation and applications: Mathematical Geology, v. 21, no. 5, p. 495-512.

Field-size distributions, historical extrapolation

Mackay, I.H., and North, F.K., 1975, Undiscovered oil reserves, *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 76-86.

Historical extrapolation

Mackenzie, A.S., and Quigley, T.M., 1988, Principles of geochemical prospect appraisal: American Association of Petroleum Geologists Bulletin, v. 72, no. 4, p. 399-415.

Organic geochemical mass balance

Magara, K., 1992, Efficiency of petroleum concentration in major petroliferous basins: Journal of Petroleum Geology, v. 15, no. 1, p. 71-85.

Areal and volumetric yields, organic geochemical mass balance

Mallory, W.W., 1972, A statistical-stratigraphic method for computing undiscovered resources of petroleum and natural gas, *in* Workshop on Techniques of Mineral Resource Appraisal, Denver, 1972, Proceedings: U.S. Geological Survey, p. 10-16.

Areal and volumetric yields

Mallory, W.W., 1975a, Accelerated national oil and gas resource appraisal (ANOGRE), *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 23-30.

Areal and volumetric yields

Mallory, W.W., 1975b, Synopsis of procedure--Accelerated National Oil and Gas Resource Evaluation, *in* Report of Panel on Estimation of Mineral Reserves and Resources, appendix to sec. II of Mineral resources and the environment: Washington, D.C., National Academy of Sciences, p. 1-5 [p. 7-12]. Appendix published separately.

Areal and volumetric yields

Marland, Gregg, 1978, A random drilling model for placing limits on ultimately recoverable crude oil in the conterminous U.S.: Materials and Society, v. 2, no. 1-2, p. 5-14.

Historical extrapolation

Marsh, G.R., 1971, How much oil are we really finding?: Oil and Gas Journal, v. 69, no. 14, p. 100-104.

Reserve growth/confirmation

Martinez, A.R., 1961, Tecnicas de prediccion aplicables a la industria petrolera de Venezuela, *in* Congreso Geologico Venezolano, 3d, Caracas, 1959, Memoria, v. 4: Venezuela, Ministerio de Minas e Hidrocarburos, Direccion de Geologia, Boletin de Geologia, Publication Especial no. 3, p. 1531-1554.

Areal and volumetric yields, historical extrapolation

Martinez, A.R., 1963, Estimation of the magnitude and duration of petroleum resources, paper 17 *in* World Petroleum Congress, 6th, Frankurt am Main, West Germany, 1963, Proceedings, sec. 8, p. 133-148.

Areal and volumetric yields, historical extrapolation

Martinez, A.R., 1966, Estimation of petroleum resources: American Association of Petroleum Geologists Bulletin, v. 50, no. 9, p. 2001-2008.

Areal and volumetric yields

Mast, R.F., and Dingler, Janet, 1975, Estimates of inferred + indicated reserves for the United States by States, *in* Miller, B.M., Thomsen, H.L., Dolton, G.L., Coury, A.B., Hendricks, T.A., Lennartz, F.E., Powers, R.B., Sable, E.G., and Varnes, K.L., Geological estimates of undiscovered recoverable oil and gas resources in the United States: U.S. Geological Survey Circular 725, p. 73-78.

Reserve growth/confirmation

Mast, R.F., Dolton, G.L., Crovelli, R.A., Powers, R.B., Charpentier, R.R., Root, D.H., and Attanasi, E.D., 1988, Estimates of undiscovered recoverable oil and gas resources for the onshore and State offshore areas of the United States, *in* Carter, L.M.H., ed., USGS research on energy resources, 1988--program and abstracts: U.S. Geological Survey Circular 1025, p. 31-32.

Deposit modeling

Mast, R.F., Dolton, G.L., Crovelli, R.A., Root, D.H., Attanasi, E.D., Martin, P.E., Cooke, L.W., Carpenter, G.B., Pecora, W.C., and Rose, M.B., 1989, Estimates of undiscovered conventional oil and gas resources in the United States--A part of the Nation's energy endowment: U.S. Geological Survey and Minerals Management Service Special Publication, 44 p.

Deposit modeling

Mast, R.F., McMullin, R.H., Bird, K.J., and Brosge, W.P., 1980, Resource appraisal of undiscovered oil and gas resources in the William O. Douglas Arctic Wildlife Range: U.S. Geological Survey Open-File Report 80-916, 62 p.

Deposit modeling

Masters, C.D., 1984a, Petroleum resource assessment--realities and precautions, *in* Masters, C.D., ed., Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, p. 1-3.

General

Masters, C.D., 1984b, United States assessment procedures and World Energy Resources Program [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 504.

Areal and volumetric yields

Masters, C.D., 1986, World crude oil resources--U.S. Geological Survey estimate and procedures, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 179-184.

Areal and volumetric yields, historical extrapolation

Masters, C.D., 1993, U.S. Geological Survey petroleum resource assessment procedures: American Association of Petroleum Geologists Bulletin, v. 77, no. 3, p. 452-453.

General

Masters, C.D., Root, D.H., and Dietzman, W.D., 1983, Distribution and quantitative assessment of world crude-oil reserves and resources: U.S. Geological Survey Open-File Report 83-728, 11 p.

Direct expert assessment

Maximov, S.P., and Vinnikovski, S.A., 1983, Development of methods for the quantitative evaluation of petroleum potential in the USSR: Journal of Petroleum Geology, v. 5, no. 3, p. 309-314.

Areal and volumetric yields, organic geochemical mass balance

McCammon, R.B., Menzie, W.D. III, and Schuenemeyer, J.H., eds., 1992, Energy- and mineral-resource assessments--How are they done? Who are they for? How effective are they?: Nonrenewable Resources, v. 1, no. 1, p. 5-38.

General

McCrossan, R.G., 1969, An analysis of size frequency distribution of oil and gas reserves of western Canada: Canadian Journal of Earth Sciences, v. 6, no. 2, p. 201-211.

Field-size distributions

McCrossan, R.G., and Porter, J.W., 1973, The geology and petroleum potential of the Canadian sedimentary basins--A synthesis, *in* McCrossan, R.G., ed., The future petroleum provinces of Canada--Their geology and potential: Canadian Society of Petroleum Geologists Memoir 1, p. 589-720.

Areal and volumetric yields, historical extrapolation, deposit modeling

McCulloh, T.H., 1973, Oil and gas, *in* Brobst, D.A., and Pratt, W.P., eds., United States mineral resources: U.S. Geological Survey Professional Paper 820, p. 477-496.

Areal and volumetric yields, historical extrapolation

McDowell, A.N., 1975, What are the problems in estimating the oil potential of a basin?: Oil and Gas Journal, v. 73, no. 23, p. 85-90.

Organic geochemical mass balance

McKelvey, V.E., 1968, Contradictions in energy resource estimates, *in* Holmes, L.B., ed., Energy, Gas Dynamics Symposium, 7th, Evanston, Ill., 1967, Proceedings: Evanston, Ill., Northwestern University Press, p. 18-26.

Areal and volumetric yields, historical extrapolation

McKelvey, V.E., 1972, Mineral resource estimates and public policy: American Scientist, v. 60, no. 1, p. 32-40. [Reprinted in 1973, *in* Brobst, D.A., and Pratt, W.P., eds., United States mineral resources: U.S. Geological Survey Professional Paper 820, p. 9-19].

Areal and volumetric yields, field-size distributions, historical extrapolation

McKelvey, V.E., and Masters, C.D., 1984, Undiscovered oil and gas resources--Procedures and problems of estimation, *in* Proceedings of the 27th International Geological Congress, Moscow, 1984: Utrecht, the Netherlands, VNU Science, v. 13, p. 333-352.

Areal and volumetric yields, historical extrapolation, organic-geochemical mass balance

McKelvey, V.E., Wang, F.H., Schweinfurth, S.P., and Overstreet, W.C., 1968, Potential mineral resources of the United States Outer Continental Shelf, appendix 5-A *of* Study of Outer Continental Shelf Lands of the United States: Los Angeles, Nossaman, Waters, Scott, Krurger & Riordan, v. 4, p. 5-A-1 to 5-A-117. Available from National Technical Information Service, Springfield, VA 22151, as report PB-188 717.

Areal and volumetric yields

Medova-Dempster, E.A., 1983, A Bayesian procedure for resource evaluation of petroleum provinces in the early stages of exploration: Halifax, Nova Scotia, Canada, Dalhousie University, M.A. thesis, 134 p.

Areal and volumetric yields, field-size distributions, historical extrapolation, direct expert assessment

Megill, R.E., 1958, How much does it cost to find oil?: Oil and Gas Journal, v. 56, no. 19, p. 189, 192, 196, 198.

Historical extrapolation

Megill, R.E., 1981, An explorationist's approach to prospect evaluation, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 263-275.

Deposit modeling, mathematical tools

Meisner, J., and Demiren, F., 1981, The creaming method--A Bayesian procedure to forecast future oil and gas discoveries in mature exploration provinces: Journal of the Royal Statistical Society A, v. 144, pt. 1, p. 1-31.

Historical extrapolation

Menard, H.W., 1981, Toward a rational strategy for oil exploration: Scientific American, v. 244, no. 1, p. 55-65.

Historical extrapolation

Menard, H.W., and Sharman, George, 1975, Scientific uses of random drilling models: Science, v. 190, no. 4212, p. 337-343.

Historical extrapolation

Menzie, D.W., Labovitz, M.L., and Griffiths, J.C., 1977, Evaluation of mineral resources and the unit regional value concept, *in* Ramani, R.V., ed., International Symposium on the Application of Computer Methods in the Mineral Industry, 14th, University Park, Pa., Pennsylvania State University, 1976, Proceedings: New York, Society of Mining Engineers of AIME, p. 322-338.

Areal and volumetric yields

Meyer, R.F., 1977, Petroleum resource data systems: Journal of the International Association for Mathematical Geology, v. 9, no. 3, p. 281-299.

Areal and volumetric yields, direct expert assessment

Meyer, R.F., 1978a, A look at natural gas resources: Oil and Gas Journal, v. 76, no. 19, p. 334-344.

Reserve growth/confirmation

Meyer, R.F., 1978b, The volumetric method for petroleum resource estimation: Journal of the International Association for Mathematical Geology, v. 10, no. 5, p. 501-518.

Areal and volumetric yields

Meyer, R.F., Fulton, P.A., and Dietzman, W.D., 1984, A preliminary estimate of world heavy crude oil and bitumen resources, chap. 16 *of* Meyer, R.F., Wynn, J.C., and Olson, J.C., eds., International Conference on the Future of Heavy Crude and Tar Sands, 2d, Caracas, Venezuela, 1982, Proceedings: New York, United Nations Institute for Training and Reasarch, p. 97-158.

Historical extrapolation

Meyer, R.F., Fulton, P.A., Drew, L.J., Root, D.R., and Grender, G., 1983, The resource potential of small oil and gas fields, chap. 2, *of* Meyer, R.F., and Olson, J.C., eds., The future of small energy resources, an international conference, Los Angeles, 1981, Proceedings; United Nations Institute for Training and Reasarch: New York, McGraw-Hill, p. 9-29.

Field-size distributions, historical extrapolation

Meyer, R.F., and Schenk, C.J., 1986, The assessment of heavy crude oil and bitumen resources, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 203-222.

Deposit modeling, organic geochemical mass balance

Miller, B.M., 1977, Probabilistic and computer methodologies used by the U.S. Geological Survey for geological estimates of undiscovered oil and gas resources in the United States, *in* Ramani, R.V., ed., International Symposium on the Application of Computer Methods in the Mineral Industry, 14th, University Park, Pa., Pennsylvania State University, 1976, Proceedings: New York, Society of Mining Engineers of AIME, p. 419-430.

Direct expert assessment, mathematical tools

Miller, B.M., 1979, The evolution in the development of the petroleum resource appraisal procedures in the U.S. Geological Survey and a summary of current assessments for the United States: Dallas, Tex., Society of Petroleum Engineers of AIME, SPE 7720, p. 79-87.

Areal and volumetric yields, field-size distributions, historical extrapolation, deposit modeling, direct expert assessment

Miller, B.M., 1981, Methods of estimating potential hydrocarbon resources by the U.S. Geological Survey--Case studies in resource assessment in the National Petroleum Reserve in Alaska and the William O. Douglas Arctic Wildlife Range, *in* Landwehr, M.L., ed., Exploration and economics of the petroleum industry: New York, Matthew Bender, v. 19, p. 57-96.

Deposit modeling

Miller, B.M., 1982a, Application of exploration play analysis techniques to the asessment of conventional petroleum resources by the USGS: Journal of Petroleum Technology, v. 34, no. 1, p. 55-64.

Deposit modeling

Miller, B.M., 1982b, The evolution in the development of petroleum resource appraisal procedures in the U.S. Geological Survey, *in* Gass, S.I., ed., Oil and gas supply modeling (Symposium, Washington, 1980, Proceedings): National Bureau of Standards Special Publication 631, p. 171-199.

Areal and volumetric yields, historical extrapolation, deposit modeling

Miller, B.M., 1983, Petroleum resource assessments of the wilderness lands in the western United States, *in* Miller, B.M., ed., Petroleum potential of wilderness lands in the Western United States: U.S. Geological Survey Circular 902, p. A1-A10.

Mathematical tools

Miller, B.M., 1986, Resource appraisal methods--Choice and outcome, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 1-23.

Areal and volumetric yields, field-size distributions, historical extrapolation, deposit modeling, organic geochemical mass balance, direct expert assessment

Miller, B.M., 1988, Methods for assessing the petroleum resources in the National Petroleum Reserve in Alaska, chap. 5 *of* Gryc, George, ed., Geology and exploration of the National Petroleum Reserve in Alaska, 1974 to 1982: U.S. Geological Survey Professional Paper 1399, p. 117-128.

Deposit modeling

Miller, B.M., and Thomsen, H.L., 1976, Geological estimates of undiscovered oil and gas resources in the United States, *in* Jantzen, R.E., ed., Tomorrow's oil from today's provinces: American Association of Petroleum Geologists Miscellaneous Publication 24, p. 1-18.

Direct expert assessment, mathematical tools

Miller, B.M., Thomsen, H.L., Dolton, G.L., Coury, A.B., Hendricks, T.A., Lennartz, F.E., Powers, R.B., Sable, E.G., and Varnes, K.L., 1975, Geological estimates of undiscovered recoverable oil and gas resources in the United States: U.S. Geological Survey Circular 725, 78 p.

Areal and volumetric yields, historical extrapolation, direct expert assessment, mathematical tools, reserve growth/confirmation

Miller, R.G., 1992, The global oil system--The relationship between oil generation, loss, half-life, and the world crude oil resource: American Association of Petroleum Geologists Bulletin, v. 76, no. 4, p. 489-500.

Organic geochemical mass balance

Miller, R.G., 1993, The global oil system--The relationship between oil generation, loss, half-life, and the world crude oil resource--Reply: American Association of Petroleum Geologists Bulletin, v. 77, no. 5, p. 900-902.

Organic geochemical mass balance

Modelevsky, M.S., and Burshtein, L.M., 1989, Sovremennoye sostoyaniye obyemno-statisticheskogo i obyemno-balansovogo metodov otsenki nachalnykh geologicheskikh resursov nefti i gaza [Present state of volumetric-statistical and volumetric-balance methods of assessment of original geologic oil and gas resources], *in* Trofimuk, A.A., ed., Otsenka prognoznykh resursov nefti v svete ucheniya akademika I.M. Gubkina [Assessment of undiscovered oil resources in light of the theories of academician I.M. Gubkin]: Novosibirsk, Russia, Nauka, p. 56-71.

Organic geochemical mass balance

Momper, J.A., 1979, Domestic oil reserves forecasting method, regional potential assessment: Oil and Gas Journal, v. 77, no. 33, p. 144-149.

Field-size distributions, historical extrapolation

Momper, J.A., 1984a, Petroleum resource assessments derived from geochemistry studies [abs.], *in* Masters, C.D., ed., Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, p. 122.

Organic geochemical mass balance

Momper, J.A., 1984b, Petroleum resources in Powder River Basin [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 509.

Organic geochemical mass balance

Momper, J.A., and Williams, J.A., 1984, Geochemical exploration in the Powder River Basin, *in* Demaison, Gerald, and Murris, R.J., eds, 1984, Petroleum geochemistry and basin evaluation: American Association of Petroleum Geologists Memoir 35, p. 181-191.

Organic geochemical mass balance

Moody, J.D., and Esser, R.W., 1975, An estimate of world's recoverable crude oil resources, *in* World Petroleum Congress, 9th, Tokyo, 1975, Proceedings: London, Applied Science Publishers, v. 3, p. 11-20.

Deposit modeling

Moody, J.D., and Geiger, R.E., 1975, Petroleum resources--How much oil and where?: Technology Review, v. 77, no. 5, p. 39-45.

Areal and volumetric yields, historical extrapolation, deposit modeling

Moody, J.D., Mooney, J.W., and Spivak, J., 1970, Giant oil fields of North America, *in* Halbouty, M.T., ed., Geology of giant petroleum fields: American Association of Petroleum Geologists Memoir 14, p. 8-17.

Field-size distributions, historical extrapolation

Moore, C.L., 1962, Method for evaluating U.S. crude oil resources and projecting domestic crude oil availability: U.S. Department of the Interior, Office of Oil and Gas, 112 p.

Historical extrapolation

Moore, C.L., 1965, Analysis and projection of the historic pattern of supply of exhaustible natural resources [abs.]: Bulletin of the Operations Research Society of America, v. 13, supp. 1, p. B-38.

Historical extrapolation

Moore, C.L., 1966a, Analyses and projections of the historic patterns of U.S. domestic supply of crude oil, natural gas, and natural gas liquids: U.S. Department of the Interior, Office of Oil and Gas, 83 p.

Historical extrapolation

Moore, C.L., 1966b, C. L. Moore's reply to J. M. Ryan: Journal of Petroleum Technology, v. 18, no. 3, p. 286-287.

Historical extrapolation

Moore, C.L., 1966c, Projections of U.S. petroleum supply to 1980: U.S. Department of Interior, Office of Oil and Gas, 42 p.

Historical extrapolation

Moore, C.L., 1966d, Ultimate domestic petroleum discoveries and discovery rates, *in* Economics and the petroleum geologists, Symposium, Midland, Tex., 1966, Transactions: Midland, Tex., West Texas Geological Society Publication 66-53, p. 118-135.

Areal and volumetric yields, historical extrapolation

Moore, C.L., 1971, Analysis and projection of historic patterns of U.S. crude oil and natural gas, *in* Cram, I.H., ed., Future petroleum provinces of the United States--Their geology and potential: American Association of Petroleum Geologists Memoir 15, v. 1, p. 50-54.

Historical extrapolation

Nakayama, K., and Van Siclen, D.C., 1981, Simulation model for petroleum exploration: American Association of Petroleum Geologists Bulletin, v. 65, no. 7, p. 1230-1255.

Organic geochemical mass balance

Nalivkin, V.D., ed., 1983, Proiskhozhdeniye i prognozirovaniye skopleniy gaza, nefti i bitumov [Origin of gas, oil, and bitumen accumulations and their forecast]: Leningrad, Nedra, 272 p.

Areal and volumetric yields, historical extrapolation, organic geochemical mass balance

Nalivkin, V.D., Belonin, M.D., Lazarev, V.S., Neruchev, S.G., and Sverchkov, G.P., 1976, Kriterii i metody kolichestvennoy otsenki neftegazonosnosti slaboizuchennykh kruppnykh territoriy [Criteria and methods of quantitative assessment of petroleum prospects in poorly studied large territories]: International Geology Review, v. 18, no. 11, p. 1259-1268.

Areal and volumetric yields, organic geochemical mass balance

National Petroleum Council, Committee on Arctic Oil and Gas Resources, 1981, Working papers of the Resource Assessment Task Group of the National Petroleum Council's Committee on Arctic Oil and Gas Resources: Washington, D.C., National Petroleum Council, 79 p.

Direct expert assessment

National Petroleum Council, Committee on Possible Future Petroleum Provinces of the U.S., 1970, Future petroleum provinces of the United States--A summary: Washington, D.C., National Petroleum Council, 138 p.

Areal and volumetric yields, historical extrapolation

National Research Council, Committee on Undiscovered Oil and Gas Resources, 1991, Undiscovered oil and gas resources--An evaluation of the Department of the Interior's 1989 assessment procedures: Washington, D.C., National Academy Press, [182 p.].

Historical extrapolation, deposit modeling, direct expert assessment, reserve growth/confirmation, quantitative characterization of undiscovered resources

Nederlof, M.H., 1980, The use of habitat of oil models in exploration, prospect appraisal, *in* World Petroleum Congress, 10th, Bucharest, 1979, Proceedings: London, Heyden, v. 2, p. 13-21.

Organic geochemical mass balance

Nederlof, M.H., 1981, Calibrated computer simulation as a tool for exploration prospect assessment, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 122-138.

Deposit modeling, mathematical tools

Nehring, Richard, 1978, Giant oil fields and world oil resources: Santa Monica, Calif., Rand Corporation Report R-2284-CIA, 162 p.

Field-size distributions, historical extrapolation, direct expert assessment

Nehring, Richard, 1978, 1981, The discovery of significant oil and gas fields in the United States: Santa Monica, Calif., Rand Corporation Report R-2654/1, 236 p.

Historical extrapolation, direct expert assessment

Nehring, Richard, 1978, 1984, Estimating reserve growth--Opportunities and challenges for petroleum resource assessment [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 511.

Reserve growth/confirmation

Nemchenko, N.N., Kramarenko, G.A., Shirkalin, V.V., and Berlizeva, Zh.V., 1990, Prognoz soderzhaniya kondensata neftegazonosnykh kompleksov Zapadnoy Sibiri [Forecast of the condensate content in oil- and gas-bearing sequences of West Siberia]: Geologiya Nefti i Gaza, 1990, no. 11, p. 2-4.

Quantitative characterization of undiscovered resources

Neruchev, S.G., 1964, Possibilities of estimating prognostic reserves of oil on a genetic basis: Petroleum Geology, v. 8, no. 7, p. 368-372.

Organic geochemical mass balance

Nesterov, I.I., and Shpilman, V.I., 1987, Teoriya neftegazonakopleniya [Theory of oil and gas accumulation]: Moscow, Nedra, 232 p.

Areal and volumetric yields, field-size distributions, deposit modeling, mathematical tools

Newendorp, P.D., 1975, Decision analysis for petroleum exploration: Tulsa, Okla., Petroleum Publishing, 668 p.

Deposit modeling

North, F.K., 1973, A sane look at U.S. gas resources, *in* National gas survey: Washington, D.C., U.S. Federal Power Commission, v. 5, p. 113-156.

Areal and volumetric yields, historical extrapolation

Oil and Gas Journal, 1969, Vast Delaware-Val Verde reserve seen: Oil and Gas Journal, v. 67, no. 16, p. 44.

Areal and volumetric yields

Oreshkin, I.V., 1991, Ispolzovaniye obyemno-geneticheskogo metoda pri otsenki prognoznykh resursov UV Prikaspiyskoy vpadiny [Application of the volume-genetic method to the assessment of undiscovered hydrocarbon resources of the Precaspian depression]: Geologiya Nefti i Gaza, 1991, no. 1, p. 26-28.

Organic-geochemical mass balance

Ovasenov, G.P., and Nadezhkin, A.D., 1962, Method of calculating prognostic reserves of oil and gas: Petroleum Geology, v. 6, no. 4, p. 230-233.

Deposit modeling

Parker, J.M., compiler, 1977, American Association of Petroleum Geologists Petroleum Resources Estimation Project pilot study--Rocky Mountain area: Tulsa, Okla., American Association of Petroleum Geologists, 61 p.

Deposit modeling, mathematical tools

Pelto, C.R., 1973, Forecasting ultimate oil recovery, *in* Symposium on Petroleum Economics and Evaluation, Dallas, Tex., 1973, Papers: Dallas, Tex., Society of Petroleum Engineers of AIME, SPE Paper 4261, p. 45-52.

Historical extrapolation, reserve growth/confirmation

Perrodon, Alain, 1972, Provinces petroliers--Approches statistique et geologique de quelques types d'habitat de l'huile et du gaz [Petroleum provinces--Statistical and geological approaches of several types of habitat of oil and gas], *in* Mineral Fuels, sec. 5: International Geological Congress, 24th, Proceedings of Section Reports, p. 176-186.

Areal and volumetric yields

Plavnik, G.I., Shpilman, V.I., and Sudat, L.G., 1987, Perevod perspektivnykh resursov nefti i gaza v zapasy mestorozhdeniy [Transition of potential oil and gas resources into field reserves]: Geologiya Nefti i Gaza, 1987, no. 2, p. 1-5.

Historical extrapolation

Podruski, J.A., Barclay, J.E., Hamblin, A.P., Lee, P.J., Osadetz, K.G., Procter, R.M., and Taylor, G.C., 1987, Resource endowment, pt. 1 *of* Conventional oil resources of western Canada (light and medium): Geological Survey of Canada Paper 87-26, p. 1-125.

Field-size distributions, historical extrapolation

Polster, L.A., Viskovsky, Yu.A., Nikolenko, V.A., Sadykova, P.I., Sheremetyev, Yu.F., and Shustova, L.G., 1984, Istoriko-geneticheskiy metod otsenki perspektiv neftegazonosnosti [Historical-genetic method of assessment of oil and gas potential]: Moscow, Nedra, 200 p.

Organic geochemical mass balance

Poon, D.C., McCormack, M., and Thimm, H.F., 1993, The application of fractal geostatistics to oil and gas property evaluation and reserve estimates: Journal of Canadian Petroleum Technology, v. 32, no. 10, p. 24-27.

Historical extrapolation

Porter, J.W., and McCrossan, R.G., 1975, Basin consanguinity in petroleum resource estimation, *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 50-75.

Field-size distributions, deposit modeling

Potential Gas Committee [1967], Potential supply of natural gas in the United States as of December 31, 1966: Golden, Colo., Potential Gas Agency, Colorado School of Mines Foundation, 38 p.

Areal and volumetric yields

Potential Gas Committee [1969], Potential supply of natural gas in the United States (as of December 31, 1968): Golden, Colo., Potential Gas Agency, Mineral Resources Institute, Colorado School of Mines Foundation, 39 p.

Areal and volumetric yields

Potential Gas Committee [1971], Potential supply of natural gas in the United States (as of December 31, 1970): Golden, Colo., Potential Gas Agency, Mineral Resources Institute, Colorado School of Mines Foundation, 41 p.

Areal and volumetric yields

Potential Gas Committee [1973], Potential supply of natural gas in the United States (as of December 31, 1972): Golden, Colo., Potential Gas Agency, Mineral Resources Institute, Colorado School of Mines Foundation, 48 p.

Areal and volumetric yields

Potential Gas Committee [1977a], A comparison of estimates of ultimately recoverable quantities of natural gas in the United States: Golden, Colo., Potential Gas Agency, Mineral Resources Institute, Colorado School of Mines Foundation, Gas Resources Studies no. 1, 27 p.

Areal and volumetric yields, historical extrapolation, deposit modeling, direct expert assessment

Potential Gas Committee [1977b], Potential supply of natural gas in the United States (as of December 31, 1976): Golden, Colo., Potential Gas Agency, Colorado School of Mines, 45 p.

Areal and volumetric yields

Potential Gas Committee [1979], Potential supply of natural gas in the United States (as of December 31, 1978): Golden, Colo., Potential Gas Agency, Colorado School of Mines, 75 p.

Areal and volumetric yields

Potential Gas Committee [1981], Potential supply of natural gas in the United States (as of December 31, 1980): Golden, Colo., Potential Gas Agency, Colorado School of Mines, 119 p.

Areal and volumetric yields, deposit modeling

Potential Gas Committee [1983], Potential supply of natural gas in the United States (as of December 31, 1982): Golden, Colo., Potential Gas Agency, Colorado School of Mines, 74 p., 2 pls.

Areal and volumetric yields

Potential Gas Committee [1985], Potential supply of natural gas in the United States (December 31, 1984): Golden, Colo., Potential Gas Agency, Colorado School of Mines, 161 p., 2 pls.

Areal and volumetric yields

Potential Gas Committee [1987], Potential supply of natural gas in the United States (December 31, 1986): Golden, Colo., Potential Gas Agency, Colorado School of Mines, 160 p., 2 pls.

Areal and volumetric yields

Potential Gas Committee [1989], Potential supply of natural gas in the United States (December 31, 1988): Golden, Colo., Potential Gas Agency, Colorado School of Mines, 160 p., 1 pl.

Areal and volumetric yields

Potential Gas Committee [1991], Potential supply of natural gas in the United States (December 31, 1990): Golden, Colo., Potential Gas Agency, Colorado School of Mines, 169 p., 2 pls.

Areal and volumetric yields

Potential Gas Committee [1993], Potential supply of natural gas in the United States (December 31, 1992): Golden, Colo., Potential Gas Agency, Colorado School of Mines, 168 p., 2 pls.

Areal and volumetric yields

Potential Gas Committee, Committee on Definitions and Procedures, 1984, Definitions and procedures for estimation of potential gas resources: Golden, Colo., Colorado School of Mines, Potential Gas Agency, Gas Resources Studies no. 2, 16 p.

Areal and volumetric yields, deposit modeling

Power, M., 1992, Lognormality in the observed size distribution of oil and gas pools as a consequence of sampling bias: Mathematical Geology, v. 24, no. 8, p. 929-945.

Field-size distributions, historical extrapolation

Pratt, W.E., 1937, Discovery rates in oil finding: American Association of Petroleum Geologists Bulletin, v. 21, no. 6, p. 697-705.

Historical extrapolation

Pratt, W.E., 1951, On the estimation of undiscovered oil reserves: Journal of Petroleum Technology, v. 3, no. 4, p. 9-10.

Areal and volumetric yields

Procter, R.M., and Taylor, G.C., 1984, Evaluation of oil and gas potential of an offshore westcoast Canada play--An example of Geological Survey of Canada methodology, *in* Masters, C.D., ed., Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, p. 39-62.

Deposit modeling

Procter, R.M., Taylor, G.C., and Wade, J.A., 1983, Oil and natural gas resources of Canada, 1983: Geological Survey of Canada Paper 83-31, 59 p.

Field-size distributions, historical extrapolation

Qahwash, A.A., and Akkad, R.A., 1978, Spatial distribution of the occurrence probability of oil fields: The Arabian Journal for Science and Engineering, special issue, p. 1-4.

Historical extrapolation

Raaben, V.F., and Bulatov, N.N., 1986, K probleme otsenki resursov nefti i gaza [Problem of oil and gas resource assessment], *in* Bakirov, A.A., Sudarikov, Yu.A., and Marasanova, N.V., eds., Problemy neftegazogeologicheskogo prognozirovaniya [Problems of petroleum geology prognostication]: Moscow, Nauka, p. 42-49.

Areal and volumetric yields

Rabinowitz, Daniel, 1991, Using exploration history to estimate undiscovered resources: Mathematical Geology v. 23, no. 2, p. 257-274.

Historical extrapolation

Raju, M.V.B., and Misra, G.B., 1991, An evaluation of the undiscovered mineral resources of India based on the concept of unit regional value: Mathematical Geology, v. 23, no. 6, p. 841-852.

Areal and volumetric yields

Rapoport, L.A., and Grender, G.C., 1983, Discovery function for oil or gas by depth zones throughout the U.S. basins [abs.]: American Association of Petroleum Geologists Bulletin, v. 67, no. 3, p. 538.

Historical extrapolation

Rapoport, L.A., and Grender, G.C., 1984, Probability distribution of United States oil and gas discoveries for various levels of exploration drilling density [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 520.

Field-size distributions, historical extrapolation

Rapoport, L.A., and Grender, G.C., 1986, Normalized measures of exploration performance in terms of basin sediment volumes: American Association of Petroleum Geologists Bulletin, v. 70, no. 12, p. 1777-1786.

Areal and volumetric yields, historical extrapolation

Reznik, V.S., 1981, Metod veroiatnostnoi otsenki resursov nefti i gaza sedimentatsionnykh basseinov [Probabilistic method of assessing oil and gas reserves in sedimentary basins]: Geologizya Nefti i Gaza, 1981, no. 4, p. 24-29. [Reprinted in 1982, International Geology Review, v. 24, no. 7, p. 797-802.]

Areal and volumetric yields

Rice, D.D., ed., 1986, Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, 267 p.

Areal and volumetric yields, field-size distributions, historical extrapolation, deposit modeling, organic geochemical mass balance, direct expert assessment, reserve growth/confirmation

Riesz, E.J., 1978, Can rank-size "laws" be used for undiscovered petroleum and mineral assessments?: BMR Journal of Australian Geology and Geophysics, v. 3, no. 3, p. 253-256.

Field-size distributions

Roadifer, R.E., 1975, A probability approach to estimate volumes of undiscovered oil and gas, *in* Grenon, M., ed., First IIASA Conference on Energy Resources, May 1975 [Proceedings]: Laxenburg, Austria, International Institute for Applied Systems Analysis, p. 333-343. [Reprinted in Grenon, Michel, ed., 1979, Methods and models for assessing energy resources--IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 268-278.]

Deposit modeling

Roadifer, R.E., 1980, Quantitative basin analysis--An important part of petroleum exploration [abs.], *in* Miall, A.D., ed., Facts and principles of world petroleum occurrence: Canadian Society of Petroleum Geologists Memoir 6, p. 997.

General

Roadifer, R.E., 1984, Size distributions of world's largest known oil and tar accumulations [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 521.

Field-size distributions

Root, D.H., 1981, Estimation of inferred plus indicated reserves for the United States, *in* Dolton, G.L., Carlson, K.H., Charpentier, R.R., Coury, A.B., Crovelli, R.A., Frezon, S.E., Khan, A.S., Lister, J.H., McMullin, R.H., Pike, R.S., Powers, R.B., Scott, E.W., and Varnes, K.L., Estimates of undiscovered recoverable conventional resources of oil and gas in the United States: U.S. Geological Survey Circular 860, p. 83-87.

Reserve growth/confirmation

Root, D.H., 1982, Historical growth of estimates of oil- and gas-field sizes, *in* Gass, S.I., ed., Oil and Gas Supply Modeling (Symposium, Washington, 1980, Proceedings): National Bureau of Standards Special Publication 631, p. 350-368.

Reserve growth/confirmation

Root, D.H., and Attanasi, E.D., 1980, An analysis of petroleum discovery data and a forecast of the date of peak production, *in* Miall, A.D., ed., Facts and principles of world petroleum occurrence: Canadian Society of Petroleum Geologists Memoir 6, p. 363-375.

Historical extrapolation

Root, D.H., and Attanasi, E.D., 1992, Oil field growth in the United States--How much is left in the barrel?, *in* Carter, L.M.H., ed., USGS research on energy resources, 1992--Program and abstracts: U.S. Geological Survey Circular 1074, p. 68.

Reserve growth/confirmation

Root, D.H., and Attanasi, E.D., 1993, Small fields in the national oil and gas assessment: American Association of Petroleum Geologists Bulletin, v. 77, no. 3, p. 485-490.

Field-size distributions

Root, D.H., Attanasi, E.D., and Masters, C.D., 1986, Some practical approaches to world petroleum resource assessment, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 185-193.

Historical extrapolation

Root, D.H., and Drew, L.J., 1979, The pattern of petroleum discovery rates: American Scientist, v. 67, no. 6, p. 648-652.

Field-size distributions, historical extrapolation

Root, D.H., and Drew, L.J., 1984, Practical solutions to problems in the application of statistical analysis to oil and gas resource appraisal illustrated by case studies, *in* Masters, C.D., ed., Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, p. 123-139.

Field-size distributions, historical extrapolation

Root, D.H., and Mast, R.F., 1993, Future growth of known oil and gas fields: American Association of Petroleum Geologists Bulletin, v. 77, no. 3, p. 479-484.

Reserve growth/confirmation

Root, D.H., and Schuenemeyer, J.H., 1980, Petroleum-resource appraisal and discovery rate forecasting in partially explored regions--Mathematical foundations: U.S. Geological Survey Professional Paper 1138-B, p. B1-B9.

Historical extrapolation

Rose, P.R., 1975, Procedures for assessing U.S. petroleum resources and utilization of results, *in* Grenon, M., ed., First IIASA Conference on Energy Resources, May 1975 [Proceedings]: Laxenburg, Austria, International Institute for Applied Systems Analysis, p. 291-309. [Reprinted in Grenon, Michel, ed., 1979, Methods and models for assessing energy resources--IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 229-247.]

Areal and volumetric yields, historical extrapolation, direct expert assessment

Roy, K.J., 1974, Quantitative assessment of resource potential using Monte Carlo simulation, *in* Gordon, Terry, and Hutchison, W.W., eds., Computer use in projects of the Geological Survey of Canada: Geological Survey of Canada Paper 76-60, p. 81.

Deposit modeling

Roy, K.J., 1975, Hydrocarbon assessment using subjective probability and Monte Carlo methods, *in* Grenon, M., ed., First IIASA Conference on Energy Resources, May 1975 [Proceedings]: Laxenburg, Austria, International Institute for Applied Systems Analysis, p. 345-359. [Reprinted in Grenon, Michel, ed., 1979, Methods and models for assessing energy resources--IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 279-290.]

Deposit modeling

Roy, K.J., 1976, Evaluation of hydrocarbon potential using probabilistic methods: Geological Association of Canada--Mineralogical Association of Canada Program with Abstracts, v. 1, p. 51.

General

Roy, K.J., Procter, R.M., and McCrossan, R.G., 1975, Hydrocarbon assessment using subjective probability, *in* Davis, J.C., Doveton, J.H., and Harbaugh, J.W., convenors, Probability methods in oil exploration--American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1975, Notes: Lawrence, Kans., Kansas Geological Survey, p. 56-60.

Areal and volumetric yields, deposit modeling

Roy, K.J., and Ross, W.A., 1980, Apportioning estimates of basin potential to fields, *in* Miall, A.D., ed., Facts and principles of world petroleum occurrence: Canadian Society of Petroleum Geologists Memoir 6, p. 319-328.

Field-size distributions

Rozanov, Yu.A., 1975, Hypothetical probabilistic prototype of an undiscovered resources model, *in* Grenon, M., ed., First IIASA Conference on Energy Resources, May 1975 [Proceedings]: Laxenburg, Austria, International Institute for Applied Systems Analysis, p. 325-331. [Reprinted in Grenon, Michel, ed., 1979, Methods and models for assessing energy resources--IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 261-267.]

Areal and volumetric yields

Rozendal, R.A., 1986, Conventional U.S. oil and gas remaining to be discovered--Estimates and methodology used by Shell Oil Company, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 151-158.

Historical extrapolation

Ryan, J.M., 1965, National Academy of Sciences report on energy resources--Discussion of limitations of logistic projections: American Association of Petroleum Geologists Bulletin, v. 49, no. 10, p. 1713-1720.

Historical extrapolation

Ryan, J.M., 1966, Limitations of statistical methods for predicting petroleum and natural gas reserves and availability: Journal of Petroleum Technology, v. 18, no. 3, p. 281-284.

Areal and volumetric yields, historical extrapolation

Ryan, J.T., 1973a, An analysis of crude-oil discovery rate in Alberta: Bulletin of Canadian Petroleum Geology, v. 21, no. 2, p. 219-235.

Historical extrapolation

Ryan, J.T., 1973b, An estimate of the conventional crude-oil potential in Alberta: Bulletin of Canadian Petroleum Geology, v. 21, no. 2, p. 236-246.

Historical extrapolation, reserve growth/confirmation

Ryckborst, H., 1980, Determining probable maximum size of oil, gas pools, oil-in-place volumes: Oil and Gas Journal, v. 78, no. 6, p. 150-154.

Field-size distributions

Ryzhik, V.M., Alenin, V.V., and Ivanova, M.N., 1985, Prognozirovaniye raspredeleniya otkryvayemykh mestorozhdeniy po velichine zapasov [Forecast of distribution of undiscovered fields by the amount of reserves], *in* Nalivkin, N.D., and Abasov, M.T., eds., Prognozirovaniye geologo-economicheskogo kachestva resursov nefti i

gaza [Forecast of geologic-economic quality of oil and gas resources]: Moscow, Nauka, p. 115-120.

Quantitative characterization of undiscovered resources

Ryzhik, V.M., Arutyunyan, R.M., and Ivanova, M.N., 1990, Primeneniye metoda vremennykh ryadov glya prognozirovaniya resursov [Application of time sequences for resource assessment], *in* Khalimov, E.M., Azamatov, V.I., and Baturin, Yu.N., eds., Resursy nefti i gaza i effectivnoye ikh osvoeniye [Oil and gas resources and efficiency of their development]: Moscow, Institut Geologii i Razrabotki Goryuchikh Iskopaeniykh, p. 57-67.

Historical extrapolation

Salmanov, F.K., and Khatizov, F.Z., 1984, Podtverzhdaemost zapasov nefti Tyumenskoy oblasti [Confirmation of oil reserves in the Tyumen region]: Geologiya Nefti i Gaza, no. 4, p. 29-33.

Reserve growth/confirmation

Schagen, I.P., 1980, A stochastic model for the occurrence of oilfields and its application to some North Sea data: Applied Statistics, v. 29, no. 3, p. 282-291.

Field-size distributions

Schroeder, E.R., 1986, Oil and gas resources of the U.S. Arctic, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 111-123.

Direct expert assessment

Schuenemeyer, J.H., and Attanasi, E.D., 1984, Forecasting rates of hydrocarbon discoveries in a changing economic environment: Marine and Petroleum Geology, v. 1, no. 4, p. 313-318.

Historical extrapolation

Schuenemeyer, J.H., Bawiec, W.J., and Drew, L.J., 1980, Computational methods for a three-dimensional model of the petroleum-discovery process: Computers & Geosciences, v. 6, no. 4, p. 323-360.

Historical extrapolation

Schuenemeyer, J.H., and Drew, L.J., 1977, An exploratory drilling exhaustion sequence plot program: Computers & Geosciences, v. 3, no. 4, p. 617-631.

Mathematical tools

Schuenemeyer, J.H., and Drew, L.J., 1983, A procedure to estimate the parent population of the size of oil and gas fields as revealed by a study of economic

truncation: Journal of the International Association for Mathematical Geology, v. 15, no. 1, p. 145-161.

Field-size distributions

Schuenemeyer, J.H., and Drew, L.J., 1991, A forecast of undiscovered oil and gas in the Frio strand plain trend--The unfolding of a very large exploration play: American Association of Petroleum Geologists Bulletin, v. 75, no. 6, p. 1107-1115.

Field-size distributions, historical extrapolation

Schuenemeyer, J.H., Drew, L.J., and Bawiec, W., 1979, Predicting future oil using three-dimensional discovery-process model [abs.]: American Association of Petroleum Geologists Bulletin, v. 63, no. 3, p. 522-523.

Historical extrapolation

Schuenemeyer, J.H., and Root, D.H., 1977, Computational aspects of a probabilistic oil discovery model, *in* Proceedings of the Statistical Computing Section: American Statistical Association, Annual Meeting, Washington, 1977, Papers, p. 347-351.

Historical extrapolation

Schultz, P.R., 1952, What is the future of petroleum discovery?: Oil and Gas Journal, v. 51, no. 12, p. 258-259, 295-300.

Historical extrapolation

Seigneurin, A., 1975, Probabilistic evaluation technique, *in* Grenon, M., ed., First IIASA Conference on Energy Resources, May 1975 [Proceedings]: Laxenburg, Austria, International Institute for Applied Systems Analysis, p. 373-381. [Reprinted in Grenon, Michel, ed., 1979, Methods and models for assessing energy resources--IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 302-310.]

Deposit modeling

Semenovich, V.V., Buyalov, N.I., Kramarenko, V.N., Kontorovich, A.E., Kuznetsov, Yu.Ya., Maksimov, S.P., Modelevsky, M.Sh., and Nesterov, I.I., 1977, Methods used in the USSR for estimating potential petroleum resources, chap. 7, *in* Meyer, R.F., ed., The future supply of nature-made petroleum and gas; UNITAR Conference on Energy and the Future, 1st, Laxenburg, Austria, 1976, Technical Reports: New York, Pergamon Press, p. 139-153.

Areal and volumetric yields, historical extrapolation, deposit modeling, organic geochemical mass balance

Semikhodsky, G.E., and Timoshin, Yu.V., 1982, Prognoz gazonosnosti DDV na oshove statisticheskikh dannykh [Assessment of gas resources of the Dneiper-Donets depression based on statistical data]: Geologiya Nefti i Gaza, 1982, no. 7, p. 9-14.

Historical extrapolation

Seyedghasemipour, S.J., and Bhattacharyya, B.B., 1990, The loghyperbolic--An alternative to the lognormal for modeling oil field size distribution: Mathematical Geology, v. 22, no. 5, p. 557-571.

Field-size distributions

Sheldon, R.P., 1976, Estimates of undiscovered petroleum resources--A perspective, *in* U.S. Geological Survey Annual Report Fiscal Year 1975, p. 11-22. [Reprinted *in* Meyer, R.F., ed., 1977, The future supply of nature-made petroleum and gas; UNITAR Conference on Energy and the Future, 1st, Laxenburg, Austria, 1976, Technical Reports: New York, Pergamon Press, p. 997-1023.]

Areal and volumetric yields, historical extrapolation

Sickler, R.A., 1975, World petroleum resources, part 1--Method and models used to estimate world petroleum resources, *in* Grenon, M., ed., First IIASA Conference on Energy Resources, May 1975 [Proceedings]: Laxenburg, Austria, International Institute for Applied Systems Analysis, p. 183-206. [Reprinted in Grenon, Michel, ed., 1979, Methods and models for assessing energy resources--IIASA Conference on Energy Resources, First, Laxenburg, Austria, 1975, Proceedings: Oxford, Pergamon Press, p. 117-131.]

Areal and volumetric yields, field-size distributions, historical extrapolation, organic geochemical mass balance, direct expert assessment

Simakov, S.N., 1986, Prognoz i otsenka neftegazonosnosti nedr na bolshikh glubinakh [Forecast and assessment of oil and gas potential at great depths]: Leningrad, Nedra, 248 p.

Field-size distributions

Singer, D.A., 1971, Multivariate statistical analysis of the unit regional value of mineral resources: University Park, Pa., Pennsylvania State University, Ph.D. thesis, 210 p.

Areal and volumetric yields

Singer, D.A., 1972, Elipgrid, a Fortran IV program for calculating the probability of success in locating elliptical targets with square, rectangular and hexagonal grids: Geocom Programs, no. 4, p. 1-16.

Mathematical tools

Singer, D.A., 1976, Resin, a FORTRAN IV program for determining the area of influence of samples or drill holes in resource target search: Computers & Geosciences, v. 2, no. 2, p. 249-260.

Mathematical tools

Singer, D.A., and Drew, L.J., 1975, The area of influence of an exploratory hole, *in* Davis, J.C., Doveton, J.H., and Harbaugh, J.W., convenors, Probability methods in oil exploration; American Association of Petroleum Geologists Research Symposium, Stanford, Calif., 1975, Notes: Lawrence, Kans., Kansas Geological Survey, p. 61-65. [Reprinted in 1976 by Economic Geology, v. 71, no. 3, p. 642-647.]

Historical extrapolation

Singer, S.F., 1975, Oil resource estimates: Science, v. 188, no. 1487, p. 401.

Areal and volumetric yields, historical extrapolation

Sluijk, D., and Nederlof, M.H., 1984, Worldwide geological experience as a systematic basis for prospect appraisal, *in* Demaison, Gerald, and Murris, R.J., eds, 1984, Petroleum geochemistry and basin evaluation: American Association of Petroleum Geologists Memoir 35, p. 15-26.

Organic geochemical mass balance

Sluijk, D., and Parker, J.R., 1984, Comparison of predrilling predictions with post-drilling outcomes, using Shell's prospect appraisal system [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 528.

Deposit modeling

Sluijk, D., and Parker, J.R., 1986, Comparison of predrilling predictions with postdrilling outcomes, using Shell's prospect appraisal system, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 55-58.

General

Smith, J.L., and Ward, G.L., 1981, Maximum likelihood estimates of the size distribution of North Sea oil fields: Journal of the International Association for Mathematical Geology, v. 13, no. 5, p. 399-413.

Field-size distributions, historical extrapolation

Snow, S.E., and Gangwar, A., 1986, The role of objective and subjective data in predicting undiscovered amounts of oil and gas in virgin or immature basins *in* Society of Petroleum Engineers, Annual Technical Conference and Exhibition, 61st, New Orleans, Louisiana, 1986: Dallas, Tex., Society of Petroleum Engineers of AIME, SPE 15556, 16 p.

Historical extrapolation

Solow, A.R., 1988, On assessing dry probabilities in offshore oil and gas exploration--An application of Bayes's theorem, *in* Chung, C.F., Fabbri, A.G., and Sinding-Larsen, R., eds., Quantitative analysis of mineral and energy resources: Dordrecht, Holland, D. Reidel Publishing, NATO ASI Series C, Mathematical and Physical Sciences, v. 223, p. 187-198.

Historical extrapolation

Starobinets, A.E., Belenky, V.Ya., Gagayev, A.V., Krasilnikova, T.B., and Sardonnikov, N.M., 1991, Printsipy i metodika automatizirovannoy otsenki perspektivnykh resursov UV i ikh nadezhnosti [Principles and method of computerized assessment of potential hydrocarbon resources and its reliability]: Geologiya Nefti i Gaza, 1991, no. 7, p. 31-34.

Deposit modeling

Steinhart, John, and Bultman, Mark, 1983, How undiscovered oil is estimated: Oceanus, v. 26, no. 3, p. 40-45.

Historical extrapolation

Steinhart, J.S., and McKellar, B.J., 1982, Future availability of oil for the United States, chap. 9, *of* Ruedisili, L.C., and Firebaugh, M.W., eds., Perspectives on energy--Issues, ideas, and environmental dilemmas (3d ed.): New York, Oxford University Press, p. 156-186.

Field-size distributions, historical extrapolation

Stone, L.D., 1990, Bayesian estimation of undiscovered pool sizes using the discovery record: Mathematical Geology, v. 22, no. 3, p. 309-332.

Historical extrapolation

Suardy, Atik, Suyanto, F.X., and Hariadi, N., 1981, Assessment of undiscovered recoverable hydrocarbon resources in Indonesia, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 164-169.

Areal and volumetric yields

Suleymanova, L.O., 1990, Dinamika vyiavleniya i podgotovki zapasov UV Tyumenskoy oblasti [Dynamics of discovery and preparation of hydrocarbon reserves in the Tymen region]: Geologiya Nefti i Gaza, 1990, no. 4, p. 17-20.

Historical extrapolation

Surkov, V.S., 1977, Evaluation methods of hydrocarbon potential reserves in east Siberia *in* Meyer, R.F., ed., The future supply of nature-made petroleum and gas; UNITAR

Conference on Energy and the Future, 1st, Laxenburg, Austria, 1976, Technical Reports: New York, Pergamon Press, p. 381-388.

Areal and volumetric yields, organic geochemical mass balance

Sverchkov, G.P., and Ivanova, K.P., 1985, Obshchaya kharakteristika kompleksa metodov, ispolsuyemogo pri opredelenii struktury prognoznykh resursov [General characteristics of methods used for identifying the structure of undiscovered resources], *in* Nalivkin, N.D., and Abasov, M.T., eds., Prognozirovaniye geologo-economicheskogo kachestva resursov nefti i gaza [Forecast of geologic-economic quality of oil and gas resources]: Moscow, Nauka, p. 88-95.

Quantitative characterization of undiscovered resources

Swetland, P.J., and Demshur, D.M., 1981, Geochemistry and basin assessment, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 62-65.

Organic geochemical mass balance

Tanner, W.F., 1978, Future oil--What is the outlook?: World Oil, v. 187, no. 6, p. 123-124, 128, 133, 136, 140.

Historical extrapolation

Thomsen, L.A., and Joggerst, Matt, 1985, Oil and gas in offshore tracts--Bias in estimates of reserves: Journal of the International Association for Mathematical Geology, v. 17, no. 4, p. 353-365.

General

Tissot, B., 1973, Vers l'□valuation quantitative du p□trole form□ dans les bassins s□dimentaires [Towards quantitative evaluation of oil formed in sedimentary basins]: Revue de l'Association Fran aise des Techniciens du P□trole, no. 222, p. 27-31.

Organic geochemical mass balance

Tissot, B., and Espitalie, J., 1975, L'evolution thermique de la matiere organique des sediments--Applications d'une simulation mathematique [Thermal evolution of organic matter in sediments--Applications of a mathematical simulation]: Revue de l'Institut Francais du Petrole, v. 30, p. 743-777.

Organic geochemical mass balance

Tissot, B.P., and Welte, D.H., 1978, Petroleum formation and occurrence: Berlin, Springer-Verlag, 538 p.

Organic geochemical mass balance

Trasdk, P.D., 1936, Proportion of organic matter converted into oil in Santa Fe Springs Field, California: American Association of Petroleum Geologists Bulletin, v. 20, no. 3, p. 245-257.

Organic geochemical mass balance

Uhler, R.S., and Bradley, R.G., 1970, A stochastic model for determining the economic prospects of petroleum exploration over large regions: Journal of the American Statistical Association, v. 65, no. 330, p. 623-630.

Areal and volumetric yields, field-size distributions

Ulmishek, Gregory, 1982, Petroleum geology and resource assessment of the Timan-Pechora basin, U.S.S.R., and the adjacent Barents-northern Kara Shelf: Argonne, Ill., Argonne National Laboratory Report ANL/EES-TM-199, 197 p.

Areal and volumetric yields

Ulmishek, Gregory, 1986, Stratigraphic aspects of petroleum resource assessment, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 59-68.

General

Ulmishek, G.F., Charpentier, R.R., and Barton, C.C., 1993, The global oil system--the relationship between oil generation, loss, half-life, and the world crude oil resource--Discussion: American Association of Petroleum Geologists Bulletin, v. 77, no. 5, p. 869-899.

Organic geochemical mass balance

Ulmishek, Gregory, and Harrison, W., 1981, Petroleum geology and resource assessment of the Middle Caspian basin, U.S.S.R., with special emphasis on the Uzen Field: Argonne, Ill., Argonne National Laboratory Report ANL/ES-116, 147 p.

Areal and volumetric yields, organic geochemical mass balance

Ulmishek, Gregory, and Harrison, W., 1984, Quantitative methods for assessment of petroleum resources of poorly known basins, *in* Masters, C.D., ed., Petroleum resource assessment: Ottawa, International Union of Geological Sciences Publication 17, p. 80-94.

Areal and volumetric yields

Uman, M.F., James, W.R., and Tomlinson, H.R., 1979, Oil and gas in offshore tracts--Estimates before and after drilling: Science, v. 205, no. 4405, p. 489-491.

Deposit modeling

Uman, M.F., James, W.R., and Tomlinson, H.R., 1980, Reply [*to* Davis and Harbaugh, 1980]: Science, v. 209, no. 4460, p. 1048.

Deposit modeling

Ungerer, P., Bessis, F., Chenet, P.Y., Durand, B., Nogaret, E., Chiarelli, A., Oudin, J.L., and Perrin, J.F., 1984, Geological and geochemical models in oil exploration--Principles and practical examples, *in* Demaison, Gerald, and Murris, R.J., eds., 1984, Petroleum geochemistry and basin evaluation: American Association of Petroleum Geologists Memoir 35, p. 53-77.

Organic geochemical mass balance

U.S. Department of Energy, and U.S. Geological Survey, 1979, Report on the petroleum resources of the Federal Republic of Nigeria: U.S. Department of Energy, Foreign Energy Supply Assessment Program Series, 63 p. Available from National Technical Information Service, Springfield, VA 22161, as report DOE/IA-0008.

Areal and volumetric yields, field-size distributions, historical extrapolation

U.S. Department of the Interior, Office of Minerals Policy and Research Analysis, 1980, Final report of the 105(b) economic and policy analysis--Alternative overall procedures for the exploration, development, production, transportation and distribution of the petroleum resources of the National Petroleum Reserve in Alaska (NPRA): Washington, D.C., U.S. Government Printing Office, 145 p.

Deposit modeling

U.S. Geological Survey, 1953, Potential oil and gas reserves of the continental shelf off the coasts of Louisiana, Texas, and California--Statement prepared by the Fuels Branch, Geologic Division, U.S. Geological Survey, at request of the Committee on Interior and Insular Affairs, U.S. Senate, February 16, 1953, 11 p.

Areal and volumetric yields

U.S. Geological Survey, 1975, Sediments, structural framework, petroleum potential, environmental conditions, and operational considerations of the mid-Atlantic area: U.S. Geological Survey Open-File Report 75-61, 143 p.

Areal and volumetric yields, historical extrapolation

U.S. Geological Survey and Minerals Management Service, 1989, National assessment of undiscovered conventional oil and gas resources--Working Paper: U.S. Geological Survey Open-File Report 88-373, 511 p. (available only on microfiche).

Field-size distributions, deposit modeling, reserve growth/confirmation

U.S. Interagency Oil and Gas Supply Project, 1980, Future supply of oil and gas from the Permian basin of west Texas and southeastern New Mexico: U.S. Geological Survey Circular 828, 57 p.

Areal and volumetric yields, field-size distributions, historical extrapolation, reserve growth/confirmation

Uri, N.D., 1978, A re-examination of undiscovered oil resources in the United States: U.S. Energy Information Administration Technical Memorandum TM/ES/79-03, 20 p. Available from National Technical Information Service, Springfield, VA 22161, as report DOE/EIA-0103/9.

Historical extrapolation

Uri, N.D., 1979, A hybrid approach to the estimation of undiscovered oil resources in the United States: Energy, v. 4, no. 6, p. 1079-1085.

Historical extrapolation

Vassoevich, N.B., Trofimuk, A.A., Kontorovich, A.E., and Neruchev, S.G., 1983, Metodicheskiye ukazaniya po kolichestrennoy otsenke prognozhykh resursov nefti, gaza i kondensata [Methodological instructions for quantitative assessment of natural resources of oil, gas, and condensate]: Moscow, Vsesoyuznyy Nauchno-Issledovatel'skiy Geologorazvedochnyy Neftyanoy Institut (VNIGNI), 215 p.

Areal and volumetric yields, deposit modeling, organic-geochemical mass balance, mathematical tools, quantitative characterization of undiscovered resources

Vassoevich, N.B., Trofimuk, A.A., Kontorovich, A.E., and Neruchev, S.G., 1988, Novye issledovaniya v oblasti diagnostiki nefteproizvodyashchikh otlozheniy i otsenki prognoznykh zapasov nefti i gaza obyemno-geneticheskim metodom [Recent studies in the field of identification of oil-generative rocks and assessment of undiscovered oil and gas resources by the volume-genetic method], *in* Vassoevich, N.B., Selected works--Petroleum potential of sedimentary basins: Moscow, Nauka, p. 147-165.

Organic-geochemical mass balance

Vidas, E.H., and Duleep, K.G., 1984, The find-rate methodology and resource base assumptions of the hydrocarbon supply model: Arlington, Virginia, Energy and Environmental Analysis, Inc., prepared for the Gas Research Institute, Contract no. 5082-711-0571, [155] p.

Historical extrapolation, reserve growth/confirmation

Vinkovetsky, Yakov, and Rokhlin, Vladimir, 1982, Quantitative evaluation of the contribution of geologic knowledge in exploration for petroleum, *in* DeMarsily, Ghislain, and Merriam, D.F., Predictive geology: Oxford, New York, Pergamon Press, p. 171-190.

Historical extrapolation

Všlgyi, L., 1983, Review of the computation methods of hydrocarbon-geological prognostics: Acta Geologica Hungarica, v. 26, no. 3-4, p. 285-299.

Areal and volumetric yields, deposit modeling, organic-geochemical mass balance

Wang, P.C.C., and Nair, V.N., 1988, Statistical analysis of oil and gas discovery data, *in* Chung, C.F., Fabbri, A.G., and Sinding-Larsen, R., eds., Quantitative analysis of mineral and energy resources: Dordrecht, Holland, D. Reidel Publishing, NATO ASI Series C, Mathematical and Physical Sciences, v. 223, p. 199-214.

Historical extrapolation

Waples, D.W., 1979, Simple method for oil source bed evaluation: American Association of Petroleum Geologists Bulletin, v. 63, no. 2, p. 239-248.

Organic geochemical mass balance

Waples, D.W., 1980, Time and temperature in petroleum formation--Application of Lopatin's method to petroleum exploration: American Association of Petroleum Geologists Bulletin, v. 64, no. 6, p. 916-926.

Organic geochemical mass balance

Weeks, L.G., 1950, Concerning estimates of potential oil reserves: American Association of Petroleum Geologists Bulletin, v. 34, no. 10, p. 1947-1953.

Areal and volumetric yields

Weeks, L.G., 1958, Fuel reserves of the future: American Association of Petroleum Geologists Bulletin, v. 42, no. 2, p. 431-438.

Areal and volumetric yields

Weeks, L.G., 1965, World offshore petroleum resources: American Association of Petroleum Geologists Bulletin, v. 49, no. 10, p. 1680-1693.

Areal and volumetric yields

Weeks, L.G., 1966a, Assessment of the world's offshore petroleum resources and exploration review, *in* Exploration and economics of the petroleum industry: New York, Matthew Bender, v. 4, p. 115-148.

Areal and volumetric yields

Weeks, L.G., 1966b, Estimation of petroleum resources--Commentary: American Association of Petroleum Geologists Bulletin, v. 50, no.9, p. 2008-2010.

General

Weeks, L.G., 1975, Potential petroleum resources--Classification, estimation, and status, *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 31-49.

Areal and volumetric yields, historical extrapolation

Welte, D.H., and Yukler, M.A., 1980, Evolution of sedimentary basins from the standpoint of petroleum origin and accumulation--An approach for a quantitative basin study: Organic Geochemistry, v. 2, no. 1, p. 1-8.

Organic geochemical mass balance

Welte, D.H., and Yukler, M.A., 1981, Petroleum origin and accumulation in basin evolution--A quantitative model: American Association of Petroleum Geologists Bulletin, v. 65, no. 8, p. 1387-1396. [Reprinted *in* Demaison, Gerard, and Murris, R.J., eds., 1984, Petroleum geochemistry and basin evaluation: American Association of Petroleum Geologists Memoir 35, p. 27-39.]

Organic geochemical mass balance

Welte, D.H., Yukler, M.A., Radke, M., and Leythaeuser, D., 1981, Application of organic geochemistry and quantitative analysis to petroleum origin and accumulation--An approach for a quantitative basin study, *in* Atkinson, Gordon, and Zuckerman, J.J., eds., Origin and chemistry of petroleum: Oxford, New York, Pergamon Press, p. 67-88.

Organic geochemical mass balance

West, Jim, 1974, U.S. oil-policy riddle--How much left to find?: Oil and Gas Journal, v. 72, no. 37, p. 25-28.

Areal and volumetric yields, historical extrapolation

White, D.A., 1979, Assessing oil and gas plays in facies-cycle wedges: American Association of Petroleum Geologists Bulletin, v. 64, no. 8, p. 1158-1178.

Areal and volumetric yields, historical extrapolation, deposit modeling

White, D.A., 1987, Conventional oil and gas resources, *in* McLaren, D.J., and Skinner, B.J., eds., Resources and world development: New York, Wiley, Physical, Chemical, and Earth Science Research Reports, no. 6, p. 113-128.

Areal and volumetric yields, historical extrapolation, deposit modeling, organic geochemical mass balance

White, D.A., 1988, Oil and gas play maps in exploration and assessment: American Association of Petroleum Geologists Bulletin, v. 72, no. 8, p. 944-949.

General

White, D.A., 1993, Geologic risking guide for prospects and plays: American Association of Petroleum Geologists Bulletin, v. 77, no. 12, p. 2048-2061.

Deposit modeling

White, D.A., and Fitzgerald, T.A., 1976, Random drilling: Science, v. 192, no. 4236, p. 206-207.

Historical extrapolation

White, D.A., Garrett, R.W., Jr., Marsh, G.R., Baker, R.A., and Gehman, H.M., 1975a, Assessing regional oil and gas potential, *in* Haun, J.D., ed., Methods of estimating the volume of undiscovered oil and gas resources: American Association of Petroleum Geologists Studies in Geology, no. 1, p. 143-159.

Areal and volumetric yields, historical extrapolation, mathematical tools, reserve growth/confirmation

White, D.A., Garrett, R.W., Jr., Marsh, G.R., Baker, R.A., and Gehman, H.M., 1975b, Three methods assess regional oil, gas potential: Oil and Gas Journal, v. 73, no. 34, p. 140-142, no. 35, p. 140-143.

Areal and volumetric yields, historical extrapolation, mathematical tools, reserve growth/confirmation

White, D.A., and Gehman, H.M., 1979, Methods of estimating oil and gas resources: American Association of Petroleum Geologists Bulletin, v. 63, no. 12, p. 2183-2192.

Areal and volumetric yields, historical extrapolation, deposit modeling, organic geochemical mass balance, direct expert assessment, mathematical tools

White, L.P., 1981, A play approach to hydrocarbon resource assessment and evaluation, *in* Ramsey, J.B., ed., The economics of exploration for energy resources: Greenwich, Conn., Jai Press, p. 51-68.

Areal and volumetric yields, deposit modeling

White, L.P., 1986, A play approach to hydrocarbon resource assessment and evaluation, *in* Rice, D.D., ed., Oil and gas assessment--Methods and applications: American Association of Petroleum Geologists Studies in Geology 21, p. 125-132.

Deposit modeling

Willums, J.O., 1981, A hybrid model for assessing regional petroleum potential with a case study of China's continental shelf, *in* Assessment of undiscovered oil and gas--Seminar, Kuala Lumpur, Malaysia, 1980, Proceedings: United Nations ESCAP, CCOP Technical Publication 10, p. 139-148.

Areal and volumetric yields, field-size distributions, historical extrapolation

Wiorkowski, J.J., 1981, Estimating volumes of remaining fossil fuel resources--A critical review: Journal of the American Statistical Association, v. 76, no. 375, p. 534-548.

Areal and volumetric yields, historical extrapolation, reserve growth/confirmation

Zapp, A.D., 1962, Future petroleum producing capacity of the United States: U.S. Geological Survey Bulletin 1142-H, 36 p.

Historical extrapolation

Zhabrev, I.P., and Nalivkin, V.D., eds., 1980, Geologo-matematicheskiye metody prognoza neftegazonosnosti lokalnykh struktur molodykh platform [Geologic-mathmatical methods of forecasting the productivity of local structures on young platforms]: Moscow, Nedra, 263 p.

Deposit modeling

Zhdanov, M.A., 1962, Prognostic reserves of oil and gas and problems of methods of estimating them: Petroleum Geology, v. 6, no. 3, p. 177-184.

Areal and volumetric yields, deposit modeling

Zielinski, R.E., and McIver, R.D., 1982, Resource and exploration assessment of the oil and gas potential in the Devonian gas shales of the Appalachian Basin: Morgantown, W.Va., U.S. Department of Energy, Morgantown Energy Technology Center Report MLM-MU-82-61-0002, DOE/DP/0053-1125, 365 p.

Organic geochemical mass balance

Zorbalas, Konstantinos, and Rogers, R.E., 1993, Resource assessment and profitability from discovering rate forecasting: American Association of Petroleum Geologists Bulletin, v. 77, no. 9, p. 1603-1604.

Historical extrapolation, quantitative characterization of undiscovered resources